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Expert Committee on Soil Survey

Comité d'experts sur la prospection pédologique

PROCEEDINGS THIRD ANNUAL MEETING

COMPTE RENDU TROISIÈME RÉUNION ANNUELLE

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Expert Committee on Soil Survey

Compte rendu
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R.E. Smith

The Problem

It has become painfully obvious to many that Soil Survey not only faces a significant problem in effectively communicating with people concerned with land use planning and management but also an identity crisis as well. The problem has its roots in the historical development of Soil Survey as an institution.

Soil Survey Mandate

Soil Survey has grown from a single purpose inventory dedicated to servicing agriculture to a relatively sophisticated, nationally coordinated land evaluation service attempting to cover a broad spectrum of land use and environmental quality concerns. Most provincial and federal resource departments, that is, those sensitized to the survey program, have accepted this mandate. Unfortunately, Agriculture Canada has not.

In the early days of the Survey inventories were for the most part, conducted by relatively small integrated or coordinated groups of federal and provincial pedologists working from or closely associated with university departments of Soil Science housed in faculties of agriculture. Reliable multi-purpose surveys based on reasonably sound pedological principles were conducted in the relative tranquillity of provincial isolation, with little or no regard for objectives to be served other than agricultural uses. Under these circumstances creation of multi-colored, complex soil maps and jargon-filled reports written more for other pedologists than users, became the Holy Grail of this idyllic pursuit. Published maps and reports often appeared years after field mapping was completed. Timely release of data or that survey information could be used for uses other than agriculture was not seriously considered. Yet, despite this rather casual method of operation, effective transfer of soil information was accomplished by providing interim reports and maps or very often by personal communication to sensitized groups in the agricultural fraternity.

Reliable interpretations of soil behavior for agriculture evolved from the effort of full time, dedicated research by soil science departments of provincial universities and regional CDA research stations. Application and extension of evolved technology to the farmer or to provincial service agencies was relatively direct, very often achieved on a personal basis, and as important, well within the capability and expertise of available survey, research and extension manpower in all three agencies.

Impact of the Canada Land Inventory

The advent of the Canada Land Inventory in the early 1960's changed this rather comfortable, dedicated, single use function served by Survey literally overnight. The CLI program focused attention on the need for land resource capability assessment not only for agriculture but for forestry, recreation and wildlife habitat as well. Recognition of the value of soil surveys for these and a variety of other non-agricultural applications including environmental impact studies, parks planning, urban planning, geotechnical engineering rapidly developed since that time (McKay, 1970).

The Role of CSSC (ECSS) and LRRI

With its established capacity to coordinate a national soil survey program, the Canada Soil Survey Committee played a major role in the development of national capability classification systems employed in the CLI program, in cooperation with provincial and federal government departments responsible for resource development. Valuable contacts between survey groups and other disciplinary groups such as foresters, wildlife biologists and recreationists evolved as a result of the program. Unfortunately, many of these *ad hoc*, temporary arrangements, usually at the working level, terminated at the conclusion of the program.

Apart from the CLI exercise, research and development effort by Soil Survey to enhance land evaluation criteria for non-agricultural uses has become fragmented, lacks national coordination and more to the point, does not involve the very necessary multi-disciplinary group action required to do an adequate job. This problem, in large measure, is due to the restrictive mandate within Agriculture Canada under which Soil Survey currently operates and departmental fear of overlapping similar programs in other federal departments, in particular, the Lands Directorate, within Environment Canada. Efficient and effective use of soil survey information for non-agronomic uses will never be achieved until a more permanent, cooperative working arrangement with other federal and provincial agencies concerned with land resource use is established with Soil Survey. The loose, voluntary associations of non-survey representatives on various ECSS working groups both from within and outside of agriculture is not effective. The recently evolved CCLRS strategy for land resource research for Canada provides a very good initial basis for establishing action plans dealing with agricultural resource research; it does not, unfortunately, address itself to forestry, or other non-agricultural concerns (CCLRS, 1980). The Land Resource Institute and its advisory ECSS group must take a lead role in resolving this shortfall in land resource research since it is they that control the only effective, operational, ecologically oriented, nationally coordinated program of land inventory in Canada. That Survey resides in agriculture should not be sufficient reason for restricting the development of a rational land resource research program to agriculture.

The Biosystematics Research Institute not only provides a precedent but also is a good example of an agency operating within Agriculture Canada with a national mandate to provide a research and service function affecting all walks of Canadian life.

Federal and provincial governments, industry, the medical profession, foreign agencies and the general public are all major users of this service. It provides a critical core group of professionals dedicated to the development and maintenance of the knowledge base required to identify plants, insects, etc. required for a broad spectrum of uses. A situation not unlike the current situation facing LRRI as regards to soil research, but without an equivalent mandate to function in like manner.

Current Issues and Concerns

Progress in effectively coordinating the greater part of all survey activities by LRRI and ECSS has been significant. They have evolved a nationally accepted system of soil classification, played a major role in developing and executing the CLI program, established the Canada Land Information System (CanSIS) and have taken a lead role in developing more detailed and quantitative agricultural land evaluation and interpretation. They have not, on the other hand, kept pace with requirements in the following critical areas:

a) Coordination and Correlation of Soil Inventories in the Forested Regions of Canada

A particular need is better geographic information on forest productivity and soil characteristics so that the value of forest lands can be better assessed (Rennie, 1978). To date, vast areas in the Boreal Forest Region stretching from the Maritimes to the Cordilleran, as well as within the Cordilleran region, have not as yet been adequately inventoried for such studies. While the CLI program and environmental impact studies (because of hydroelectric development and oil exploration) have accelerated inventory activities in these regions the short fall is still enormous. Hampered by mandate and preoccupied with agricultural and urban-rural pressure area inventories Soil Survey has been unable to deal with forest region surveys effectively. The shortfall is being taken up by federal and provincial ministeries of forestry and the private sector employing a variety of ecological forest site classifications (Kimmins, 1977 and Thie, et al., 1976).

There are, at present in B.C., three major approaches to ecological classification of forest land aside from standard soil surveys. Some of them claim to be multi-purpose or general purpose classifications, equally as suitable for agriculture and host of other land use assessments as soil surveys.

With this diversity of approaches competing for scarce dollars and manpower, it goes without saying that those involved in classification and its application must frequently meet to review programs and experience in the usefulness of these various approaches. The bringing together of all parties involved requires more than the current involvement of one national soil correlator for B.C., the Yukon and N.W.T. or a part-time chairman of soil interpretations for forestry within ECSS.

The problem requires a major continuing thrust involving not only ECSS and LRRI but also the Lands Directorate and the regional federal, provincial and private groups engaged in forest land inventories. Several attempts at providing national forums to examine the state of the art of ecological classification systems and their applications by the Lands Directorate and the Canadian Institute of Forestry have met with very limited success. A leadership role in this area by the ECSS and the LRRI is urgently required. Apart from B.C., the operational capability to conduct ecologically oriented multipurpose land inventories in Canada still rests within federal and provincial departments of Agriculture. If knowledge of soil characteristics and soil behavior is required for better land productivity assessment in Canada (Rennie, 1978) then the contribution of Soil Survey, particularly in the Boreal Forest Region cannot be dismissed. While the area covered by Soil Survey in this forest region is limited largely to the agricultural-forestry fringe they have proven to be none-the-less, useful for forest land evaluation where they do exist (Veldhuis, 1978; Krause, 1980).

b) Non-Agronomic Land Evaluation and Interpretations

Research and development directed at the improvement of land evaluation and application of soil survey information for non-agronomic uses, with but a few exceptions, is virtually non-existent in Canada. The reason for this situation lies simply in the fact that neither within the Research Branch of Agriculture, where soil survey resides, nor other departments of the federal and provincial governments where soil information is required for operational use, are there agencies that in themselves have the expertise or resources to undertake such research. This does not mean that comprehensive nor sophisticated research does not exist for forest site growth studies, wildlife habitat studies, engineering and geotechnical studies, waste disposal, environmental degradation, etc. What is lacking is the application of this research to make soil surveys more effective. Without commitment of full-time staff to such work through an agency such as the Land Evaluation Section of LRRI development of improved or enhanced soil interpretations will remain, as at present, an ad hoc uncoordinated inadequate effort. At present, only 5 percent of LRRI staff is committed to more detailed, quantitative agricultural land evaluation; no staff is available for other land use evaluations.

Except for the work in the Resource Analysis Branch of the Ministry of Environment in B.C., provincial survey units have been forced to adopt methods and criteria for non-agronomic interpretations developed by various agencies and divisions of the Soil Conservation Service of USDA (Acton, 1980; Coen, 1976). Most of these criteria have never been tested for regional suitability. Current critical areas for development of more detailed and more suitable interpretation criteria include:

1. Forest Land Evaluations and Interpretations

In Canada forest soils have been rated for their productivity based either on available local growth data or CLI capability classes; tree species suitability; requirements for stand regeneration; erosion hazard; windthrow hazard and soil trafficability. In the absence of national coordination, individual soil survey units have had to take the initiative in developing and testing methods and criteria for forestry interpretations. As expected interpretation from different provinces vary greatly. User surveys suggest that foresters are unfamiliar with, and have little confidence in site data gathered by groups other than foresters (Veldhuis, 1978).

In the state-of-the-art reported by Krause (1980) it is suggested that a nationally coordinated program is urgently required to improve methods of forest land inventory and interpretations. He has suggested that what is required is a new forestry working group within ECSS that would be composed of representatives from various soil survey units, foresters experienced in management and familiar with planning drawn from provincial governments, industry, universities and the Canadian Forestry Service.

I would suggest that no only is this new working group required on a permanent basis but that forest soil specialists are also required within the Land Evaluation group in LRRI and within regional or provincial soil survey groups to ensure a national forest land inventory coordination function and, as well, land evaluation research capability within Soil Survey. Without such capacity, application of soil survey information for forestry uses will continue to be of limited value because of the mistrust of foresters for methods and interpretations developed by agricultural soil scientists.

2. Wildlife Habitat Land Evaluation and Interpretations

Soils directly affect the kind and amount of vegetation available to wildlife as food and shelter and as well, affect the quality and availability of water. The kind and abundance of wildlife is dependent upon the amount and distribution of food, shelter and water available (McLeese, 1981). Overlying available 1:250,000 CLI capability maps for ungulates and waterfowl with available soil maps would suggest that the relationship of soils to elements of various habitat types that range from open grasslands to hardwood and coniferous forests and wetlands is not well understood (Goulden, 1971).

The Lands Directorate through the activity of its Ecological Land Classification Committee has provided a national forum to examine the state-of-the-art of attempting the incorporation of wildlife information into ecological land inventories (Taylor, 1980). Results of the workshop again indicate that there exists in Canada a large amount of detailed and sophisticated wildlife habitat research. While not achieving its goal of resolving the problem of integrating this information into various types of land resource surveys to make them more effective it has, however, exposed some very useful regionally adopted methodologies. It is apparent that a continuing national and regional thrust in this area, as in forestry, is required if meaningful methodologies are to evolve.

3. Engineering Uses and Other Related Interpretations

While a very useful beginning in adapting soil survey information to a broad range of potential users ranging from engineers involved in soil conservation, waste disposal or transportation and road design to specialized groups of planners involved in community and urban planning, intensive outdoor recreational uses and parks planning, has been achieved since 1973, much is still left to be done. Some of the more pressing concerns would appear to be a) regional testing of adopted USDA interpretation guidelines for various engineering application by passive or planner oriented users, and b) the development of regionally adopted engineering manuals aimed at educating soil scientists on methods for conducting terrain capability studies for engineering uses, on the one hand, and others to show both active and passive users how soil and landscape studies can be used to assess capability for specific uses, on the other. An excellent example of this type of manual is the one prepared by D. Maynard (1980) on terrain capability for residential settlements in B.C. However, development of guidelines and the preparation and extension of such material requires dedication of full-time staff to such tasks. With the exception of the Resource Analysis Branch of the B.C. Ministry of Environment and G. Wilson in LRRI, no parallel situation exists in other provinces today. The chances, therefore, of any meaningful work in the province on enhancing soil interpretations for engineering uses seems remote.

c) Soil Survey Extension and Educational Programs and Activities

Market surveys in Manitoba (McKay, 1970; Veldhuis, 1978) in B.C. (Valentine, 1980) and Ontario (Van den Broek, 1980) dealing with the utility of soil survey information reinforces a number of well known facts on the matter. Among the more salient of these are:

1) A multitude of people engaged in a wide variety of land use management, development and planning functions find soil survey information to be an important tool in their operations;

2) that there is a growing need for more detailed and quantitative information on soil characteristics and their behavior under different systems of management, for non-agronomic, as well as agronomic uses of land;

3) that non-agronomic users require a knowledge of many of the same basic properties of soils as do agronomic users;

4) that people who are not familiar with soil survey procedures and information find soil maps, regardless of scale, and soil reports extremely difficult to utilize because of map symbol complexity; use of unfamiliar jargon, in particular soil classification names; legends are not standard and often difficult to read;

5) that a greater effort is required by soil surveyors, both before and after completion of the map project to go out and "sell" their product;

6) that all users are concerned with the quality of the maps and interpretations provided;

7) that there is a lack of uniform coverage over much of the country by up-to-date information (out-of-print maps and gaps in coverage is a common complaint and a great source of irritation for users);

8) that Soil Survey is not well enough known as a source for land resource information, i.e. we have become preoccupied with operations and have forgotten to provide some basic public relations work necessary to stay visible. An approach similar to that taken by the Lands Directorate in Environment Canada in publicizing their programs and activities through the use of glossy colored layman oriented brochures, technical bulletins for professionals engaged in land resource work and newsletters containing pithy items on the progress of various program elements is urgently required both at the provincial level and at the national.

In attempting to be all things to all people Survey has done some things well, such as quality land inventories; some things rather poorly, i.e. disseminating land resource information to both agronomic and non-agronomic users in a manner suitable to their needs; and finally some things not at all, i.e. effectively publicizing the program. It is ironic that despite the major role we have played in coordinating and executing the

Canada Land Inventory, which enjoys an international reputation due in large measure to the publicity efforts of the Lands Directorate in DOE, major groups of potential non-agronomic users of survey information are basically unaware of this program and its impact on resource development in Canada. We've got a big Cadillac with a wheezy engine and a poor set of wheels.

Summary and Recommendations

Long Term Concerns

What is required in the long term is a broadened mandate by LRRI to develop a more comprehensive program of land resource research addressing non-agronomic objectives and concerns as well as agronomic concerns that at present have fallen into the gaps between various federal ministries. It must, in particular, recognize an expanded role in forest land inventory and evaluation in the Boreal Forest Region of Canada. The program must recognize the role that Soil Survey can play through LRRI for such additional concerns as the impact of policies and programs on efficient use of rural and urban lands; on the use and development of lands with potential for production of non-renewable resources; land required for transportation and communication; the impact of policies and programs on watersheds, aquifers, lands critical to the quality and quantity of the country's water supply; the impact of policies and programs or lands which have recreational asethic or ecological importance. Without this more comprehensive program of land evaluation, application of soil and extension of soil survey information for non-agronomic uses will remain unsatisfactory.

Recommendation 1

In recognizing these long term concerns for a more efficient and effective soil survey program the ECSS working group concerned with non-agronomic interpretations unanimously recommends that CDA increase the staff of the Land Resource Research Institute for the purpose of conducting an increased level of correlation and land evaluation research to develop improved guidelines for effective interpretation of soil survey data for non-agronomic purposes.

A strategy to develop a suitable action plan to implement such a recommendation will require the input of the ECSS and various agencies in the federal and provincial governments concerned with the application of survey information to their needs.

Short Term Concerns

In the short run, much can be done to improve the usefulness of soil maps and reports for agronomic and non-agronomic application. We need to use a language that is well understood by the user. A difficult task, considering the great variety of uses to which survey data can be applied. In addition to language we must use maps, simple derivative and interpretation maps with simple readily understood legends. As important, the soil information must be provided in a timely manner. Our goal should be to publish soil surveys within a year after field work is completed. The data management capability of CanSIS, particularly the cartographic file, will need to be exploited to its fullest capacity if the latter goal is to be achieved.

Non Agronomic Interpretations

While it might be more advantageous to take a more positive approach to presenting soil interpretations, it appears that for the present, we must commit ourselves to the more negative approach of presenting empirical interpretations expressed in terms of limitations/suitability classes as recommended by the Non-agronomic Interpretations Working Group in 1980 (Acton, 1980). Perhaps, the alternative more positive approach may emerge as a result of a more comprehensive soil survey interpretation and land evaluation program in the future.

Soil Survey Extension and Educational Programs and Activities

A number of very useful activities aimed at improving the dissemination of soil survey information and visibility of the Soil Survey program both at the national level and, more important, at the provincial and local levels is recommended.

Recommendation 2

It is the view of the working group that an aggressive publicity campaign aimed at educating the general public on the nature and impact of the soil survey program be initiated immediately. The working group has identified the following priority "Soil Surveys Can Help You" brochures to be prepared by people either within soil survey or associated with soil survey through the working group on non-agronomic interpretations. The target areas or users and volunteers for the work are as follows:

1. Soil Surveys Can Help You - J.H. Day.
2. Farmers and Ranchers - C. Acton for eastern Canada, no volunteer for western Canada.
3. Land Use Planners - R.H. Louie, B.C.
4. Home Buyers - no volunteer.
5. Recreation Planners - G. Coen, Alberta.
6. Septic Filter Fields - K. Webb, Nova Scotia.
7. Engineers - Michalyna, Eilers, Man.
8. Foresters - Boreal Forest Region, G. Pierpoint
   - Cordilleran Region, D. Moon
9. Geologic and Natural Hazards - Terrain Analysis Group B.C.

It is the intention of the working group to table edited versions of these brochures at the next annual meeting of ECSS and to publish the "Soil Survey Can Help You" brochure already prepared by J.H. Day.

In addition to the above brochures the working group also felt that the publication of stand-alone products such as small scale, provincial, regional and national thematic maps and technical bulletins such as the one prepared by G. Wall et al on soil erosion potential that are suitable for general distribution should also be given priority consideration.

An interesting suggestion by Bob van den Broeck is that a road tour of mapping projects pointing out interesting soil landscape viewpoints and typifying sites of the dominant soils of the areas should be printed on the covers of soil survey reports. This apparently is a routine measure taken in Holland.

Newsletters and Progress Reports on Survey Activities

A second useful activity well within our capability to undertake is to publish newsletters on a regular basis, whether it be more often than once a year depends on the nature and level of activity in each province. I dare say the action in B.C. warrants monthly releases. These reports should be aimed at traditional users as well as initial users of soil survey data. They could be sequentially released providing information relevant to both groups of users. Initial releases should focus on the nature of the survey program, identify available soil map coverage and as important where maps and reports can be obtained. Other releases should focus on CanSIS and the current capability of the system to provide tailor-made packages of information for "passive users", i.e. those unable to utilize uninterpreted data, as well as for "active users", i.e. those who are able to utilize detailed technical data and to make their own interpretations. By far the largest group is the passive users.

Workshops and Educational Programs

As previously mentioned, a greater effort is required by soil surveyors to go out and sell soil surveys to improve the effective use of soil surveys. Our present system of soil survey operation does not permit much more than an ad hoc, token effort in such activities. We must look to full-time provincial extension specialists to take the lead in this work. Unfortunately, specialists in soil conservation, soil oriented agronomy, resource planning, parks and recreational planning and engineering applications of survey data who are themselves familiar with soil survey procedures and data are very few in number. With the assistance of such people surveys, as part of the normal procedure for conducting inventories, should participate and assist in the planning and conducting of public or user agency meetings at the local level to introduce soil survey procedures, conducting field tours, providing instructions on the uses of published surveys.

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Soil Erosion Potential - Brant County, Ontario

Gregory J. Wall[1], W.T. Dickinson[2] and J.W. Greuel[3]

Introduction

Soil erosion by water is a naturally occurring process that can be greatly enhanced by man's activity. Any practice that enhances soil run-off or reduces the natural protection afforded by vegetative cover will generally lead to increasing erosion levels. Within the agricultural sector we have become accustomed to thinking of soil erosion as an action that reduces production potential, depletes nutrients, and degrades soil tilth. However, recent studies in the Canadian Great Lakes basin have illustrated the need to look beyond the onsite effects of soil erosion and consider the role of sediments derived from cropland on water quality. Any comprehensive soil conservation program will recognize this dual nature of the problem associated with soil erosion by water.

The Brant County Soil Survey Report describes in detail the nature, extent and distribution of soil materials within the County. The purpose of this discussion is to provide interpretations of the water erosion potential of the Brant County soils and soil landscapes. Specifically the objectives may be summarized as follows:

(a) to determine the relative erodibility of surficial soil materials;
(b) to determine the effect of soil erodibility and slope on soil erosion potential;
(c) to establish cropland soil erosion potential and;
(d) to provide a methodology whereby a nomograph and information contained in the soil survey report may be used to assess site specific cropland soil erosion problems and alternative solutions.

Factors Affecting Soil Erosion by Water

Farm on-site planning for soil and water conservation requires information on the relationships between those factors that cause soil erosion and those practices that may reduce such losses. The most important factors affecting agricultural erosion are usually considered to be: rainfall-runoff, soil erodibility, slope gradient and length, and vegetative cover.

Both rainfall and runoff parameters must be considered in the assessment of a water erosion problem. Rainfall induced erosion is maximum when the energy of the rainfall is greatest. In Ontario, it is the high intensity, short duration thunderstorm activity of the summer months that produce the

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3/ Summer Youth Employment Program, 1980

highest energy rainfall events. On the other hand, runoff from agricultural land is maximum during the spring months when the soils are usually saturated, snow is in its final stages of melting and evapotranspiration is minimal. A good soil and water management program must address itself to rainfall and runoff problems in both the spring and summer periods.

Soil erodibility is the inherent susceptibility of a soil material to erode based upon the properties of the soil itself. Soil properties that influence erodibility by water are those that affect the infiltration rate, permeability and total water capacity of the soil, and those properties that resist dispersion splashing, abrasion and transporting forces of the rainfall and runoff. Silt, very fine sand and clay textures often have the greatest soil erodibility potential, while sand, sandy loam and loam textured soils usually have lower inherent soil erodibility. Maintenance of soil organic matter and soil structure through good soil management can greatly affect soil erodibility potentials.

Soil erosion by water has been found to increase both with increasing slope gradients and slope lengths. Steep slopes facilitate runoff of water while reducing the potential for water infiltration. The erosion potential of long slopes is enhanced by the high potential for large runoff volumes with high erosive energy at downslope positions. Hence, effective slope length is an important soil conservation consideration in farm field consolidation efforts.

The effect of vegetative cover or mulches in reducing soil erosion is well known. Table 1 illustrates mean soil erosion losses for crops grown in southern Ontario, (van Vliet et al., 1976). Highest soil erosion losses are observed for row crops (tomatoes, potatoes, beans, continuous corn) that provide minimal canopy or ground cover protection to the erosive forces of rainfall and runoff. On the other hand, minimal soil losses are observed for crops with dense canopy protection (perennial forage, woodlands).

Measurement of Soil Erosion Factors

In order to make meaningful recommendations with respect to soil conservation practices, one must be able to recognize the significance of a soil erosion problem and provide appropriate cost effective erosion control alternatives when a problem is encountered. While qualitative approaches can be useful in many circumstances, the temporal nature of soil erosion as well as the difficulty in witnessing sheet erosion losses in the field make a quantitative approach to erosion assessment and control recommendations more practical.

The quantification of the factors affecting agricultural erosion (rainfall, soil erodibility, slope factors, vegetation, conservation measures) is based on widespread erosion research of nearly 10,000 plot years of field data and rainfall records from about 2,000 weather stations in North America. The resulting soil erosion formula is currently used extensively in the United States Department of Agriculture and the Soil Conservation Service in applying and planning conservation measures that reduce soil erosion to acceptable amounts (Wischmeier and Smith, 1978). It is only recently that the erosion factors have been quantified for use in Ontario (van vliet et al., 1976; van Vliet and Wall, 1979).

The water erosion formula used to predict average annual soil loss through sheet and rill erosion is the universal soil loss equation (Wischmeier and Smith, 1978):

TABLE 1 - MAGNITUDE OF POTENTIAL SHEET EROSION LOSSES FROM AGRICULTURAL CROPPING SYSTEMS IN SOUTHERN ONTARIO[1]

Crop	Mean soil erosion loss (tonnes/ha/yr)
Horticultural crops (potatoes, tomatoes, etc.)	9.1
Beans (soya and white)	7.6
Continuous corn	6.7
Corn in rotation	3.7
Tobacco	3.5
Small grains	3.4
Meadow in rotation	2.6
Permanent pasture	0.4
Woodlands	0.2

[1] van Vliet et al., (1976)

A = RKLSCP where A, is the computed soil loss in tons per acre;

R, the rainfall factor, is the number of erosion-index units in a normal year's rain. The erosion index is a measure of the erosive force of a specific rain. When other factors are constant, storm losses from rainfall are directly proportional to the product of the total kinetic energy of the storm times its maximum 30-minute intensity;

K, the soil erodibility factor, is the erosion rate per unit of erosion index for a specific soil in cultivated continuous fallow. This unit is in tons per acre.

L, the slope length factor, is the ratio of soil loss from the field slope length to that from a 72.6 foot plot.

S, the slope gradient factor, is the ratio of soil loss from the field slope gradient to that from a 9% plot slope.

C, the cropping-management factor, is the ratio of soil loss from a field with specific vegetation or cover and management to that of the standard bare fallow condition. This factor measures the combined effect of all the interrelated cover and management variables plus the growth stage and vegetal cover at the time of rain.

P, the erosion control practice factor is the ratio of soil loss with the practice to that from a field with no practices.

When the numerical values for each variable are multiplied together, the product is the average annual soil loss in tons/ac/yr. It should be emphasized that the formula estimates sheet and rill erosion but does not consider soil losses caused by gully erosion or stream channel erosion. Since the erosion formula does not contain a transport or delivery factor, it does not predict sediment load of streams. A brief description of factors in the soil erosion formula follow.

Rainfall Factor (R)

The R-value reflects locational differences due to total erosivity and distribution of erosive rains. Erosion research data showed that when other factors are held constant, the soil losses per storm are directly proportional to the product of the total kinetic energy of the storm times its maximum 30-minute intensity. This erosion index reflects the combined ability of raindrop impact to dislodge soil particles and of runoff to transport the soil particles from the field.

The R-value is the longterm average annual value of the erosion index and ranges from 25 to 100 in Ontario. Brant County has a R-value of 80. The R-value can be used directly in the Universal Soil Loss Equation formula. The distribution of the rainfall erosion factor (R) in southern Ontario is shown in the Appendix.

Soil Erodibility Factor (K)

The K-factor reflects the ease or resistance of soil to erode when rain falls on fallowed soil. The soil erodibility factor (K) has been determined experimentally for many soils by field measurement, and a soil nomograph or equation has been developed to compute K-values on the basis of soil properties.

The five soil parameters used in the nomograph or equation computation of a (K) value are: 1) % silt + very fine sand, 2) % sand, 3) organic matter,

4) type of soil structure and 5) soil permeability (Wischmeier et al., 1971)

The soil nomograph used for the computation of (K) values in the study is included in the Appendix.

Slope Factors (Length, L and Slope %, S)

These factors are combined because of the close interactions between steepness (S) and length of slope (L) on soil loss. Doubling of slope length increases soil loss by about 1.5 times while doubling of slope steepness increases erosion by approximately 2.5 times.

Cropping Management Factor (C)

This factor is the ratio of soil loss from land cropped under specific conditions to the corresponding loss from continuously tilled or fallow land. The factor measures the combined effect of all the interrelated cover and management variables. C-value computation also consider the potential for erosive rainfalls during the various crop stage periods. Hence, the C-factor for a given cropping system will change geographically with rainfall distribution. A cropping factor of 0.15 signifies that the erosion will be reduced to 15% of the amount that would have occurred under the same set of field conditions if the land had been kept in a fallow conditions. The computation of the C-factor is quite complex because of the many facets of crop and soil management considered in its development.

Van Vliet and Wall, (1979) have compared soil loss prediction values obtained with the universal soil loss equation to measured sheet and rill erosion losses from runoff plots in southern Ontario. Results of this study indicated no significant differences between predicted and measured soil loss values.

It is the quantitative relationships developed for use in the universal soil loss equation that have been used in this report to assess soil erosion potential for the soils and associated slopes in Brant County, Ontario.

Soil Erodibility - Brant County

Soil erodibility has been defined previously to be the inherent resistance of a soil material to resist the erosive forces of rainfall and runoff. Thus, a soil erodibility value does not reflect the influence of slope or cover factors. While many indices of soil erodibility exist, the K factor from the universal soil loss equation (Wischmeier and Smith, 1978) has been selected to illustrate the relative erodibility of soil materials in Brant County. Erodibility values (K) were determined for all the soil series mapped in Brant County by the nomograph method of Wischmeier et al. (1971) (Appendix). The five soil parameters (% silt + % very fine sand, % total sand, organic matter %, soil structure, permeability) used in the nomograph to calculate the final K values were obtained from the Brant County soil survey report.

Table 2 illustrates the erodibility values (K-values) for each of the soil series described in Brant County. These erodibility values range from a low of 0.13 for the Granby soil to a high of 0.49 for the Tuscola soil. Hence, the Tuscola soils may be considered to be approximately 3½ times as erodible as the Granby soils. The appropriate soil erodibility classes for the soil series in Brant County also are given in Table 2. The soil erodibility potential for these soils range from negligible (Granby soils) to severe

TABLE 2 - SOIL SERIES ERODIBILITY INDICES, BRANT COUNTY

Soil Series Name	Erodibility Value (K-Value)[1]	Erodibility Class[2]
Ayr	0.19	2
Berrien	0.33	3
Beverely	0.24	2
Bookton	0.41	4
Brady	0.26	2
Brant	0.42	4
Brantford	0.35	3
Brisbane	0.23	2
Burford	0.31	3
Caledon	0.29	2
Camilla	0.23	2
Colwood	0.40	4
Donnybrook	0.22	2
Dorking	0.23	2
Dumfries	0.25	2
Fox	0.25	2
Gobles	0.25	2
Granby	0.13	1
Guelph sand	0.29	2
Guelph	0.36	3
Heidelberg	0.39	3
Kelvin	0.23	2
London	0.31	3
Muir	0.41	4
Oakland	0.21	2
Parkhill	0.31	3
Scotland	0.16	2
Teeswater	0.39	3
Toledo	0.26	2
Tuscola	0.49	4
Waterloo	0.27	2
Wauseon	0.22	2
Woolwich	0.42	4

[1]Wischmeier et al., (1971)

[2]Soil Erodibility Class as defined in Table 3

TABLE 3 - GUIDELINES FOR ESTABLISHING SOIL ERODIBILITY CLASSES

Class	Soil Erodibility Potential	K-Value[1]	Soil Characteristics
1	Negligible	<.15	Silt and very fine sand <25%; >4% organic matter; very fine granular structure; rapid permeability.
2	Slight	.15-.30	Silt and very fine sand >40%; <4% organic matter; medium or coarse granular structure; moderate permeability.
3	Moderately Severe	.30-.40	Moderately high (<3%) organic matter; medium or coarse granular structure; slow to moderate permeability.
4	Severe	.40-.50	High (>80%) silt and very fine sand; low (<2%) organic matter; blocky, platy or massive structure; slow permeability.
5	Very Severe	>.50	Very high (>90%) silt and very fine sand; low (<1%) organic matter; blocky, platy or massive structure; very slow permeability.

[1]Wischmeier, W.H. and D.D. Smith (1978)

(Bookton, Brant, Colwood, Muir, Tuscola, Woolwich). The guidelines used for establishing soil erodibility classes on the basis of K-values are given in Table 3.

Soil Map Unit Erosion Potential - Brant County

The soils map of Brant County delineates, among other things, unique combinations of soil materials and associated slope gradient and pattern. These combinations of soil and slope properties depicted on the soil map may be called map units. Table 4 illustrates all the combinations of soil and slope that occur on the Brant County soil map. Since slope has such a pronounced effect on soil erosion, it would be useful to know the erosion potential (soil erodibility and slope affects) of the respective map units.

The universal soil loss equation predicts soil loss (tonnes/ha/yr) on the basis of rainfall, erodibility, slope and vegetative cover. The rainfall erosion value for Brant County has a constant value of 80. Erodibility and slope information are available for all map units. Therefore, if the vegetative cover is assumed to be the same for all soils a potential soil loss can be computed for the assumed land use using the universal soil loss equation (Wischmeier and Smith, 1978).

Figures 1, 2, 3 illustrate iso-erosion lines (<6, <11, <22, <33, >33 tonnes/ha/yr) derived on the basis of soil erodibility (K-factors) and slope (LS) factors for the following land uses: bare soil, corn crop grown continuously, and small grain crop, respectively. On the basis of the four iso-erosion lines, a five class erosion potential classification was derived for each land use as follows:

Soil Erosion Class	Soil Erosion Potential tonnes/ha/yr soil loss	
1	Negligible	(<6)
2	Slight	(6-11)
3	Moderately Severe	(11-22)
4	Severe	(22-33)
5	Very Severe	(>33)

Now the erosion potential of each soil map unit can be assessed for each of the three land uses from soil erodibility (K-factor), and slope (LS) factors of the map units. Table 4 illustrates the erosion potential classes for all map units in Brant County for bare soil, corn and small grain land uses. The soil erodibility values (K) and slope factors (LS) used to derive the respective soil erosion class from Figures 1, 2, 3 are also indicated on Table 4. For example, an Ayr soil on A slopes (AyA) with K= 0.19 and LS = 0.30 has slight soil erosion potential (class 2; 6-11 tonnes/ha/yr soil loss) for bare soil conditions and negligible soil erosion potential (class 1; 0-6 tonnes/ha/yr soil loss) for both corn and small grain land uses.

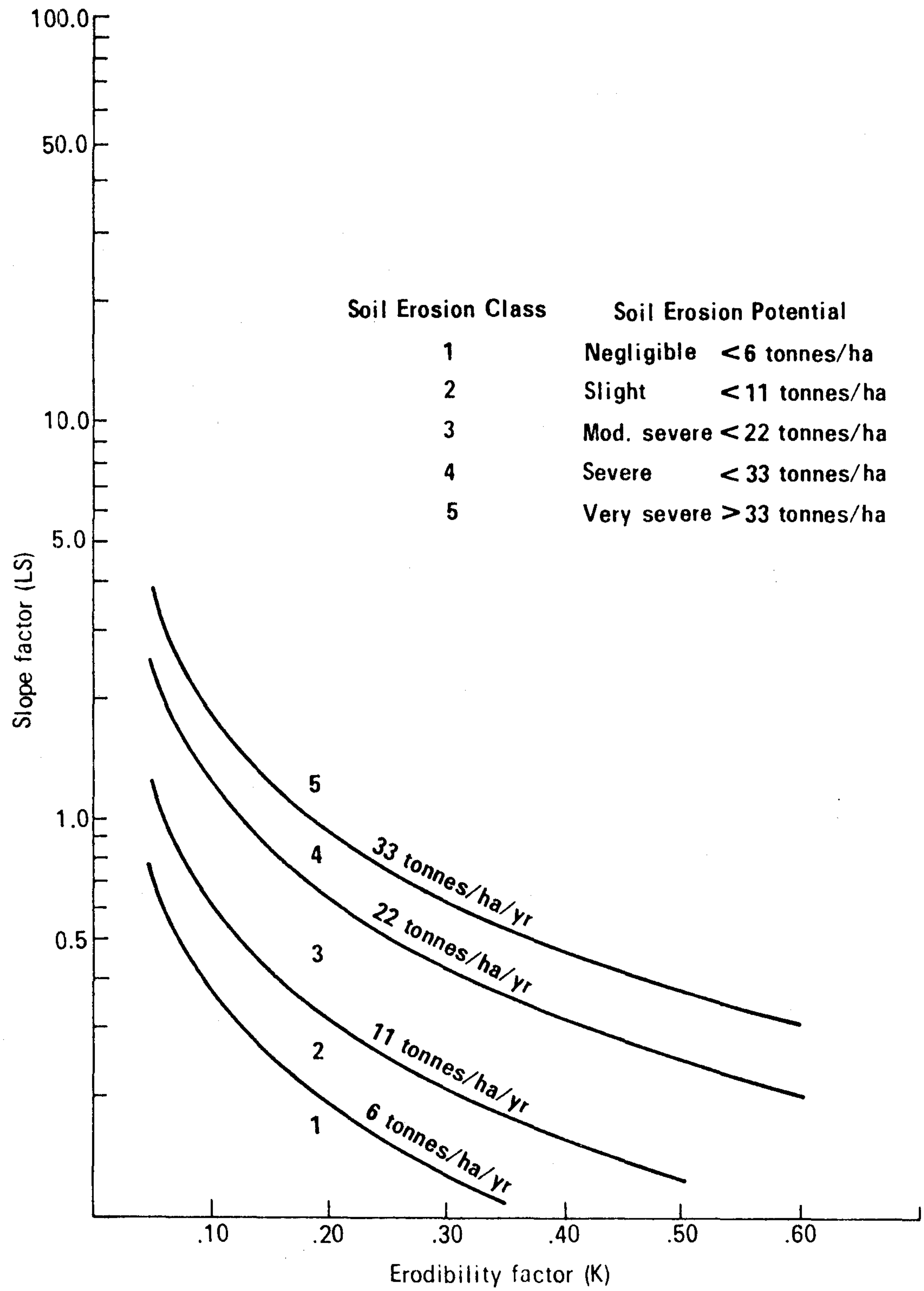

Figure 1. Soil erodibility and slope constraints on soil loss from unvegetated land.

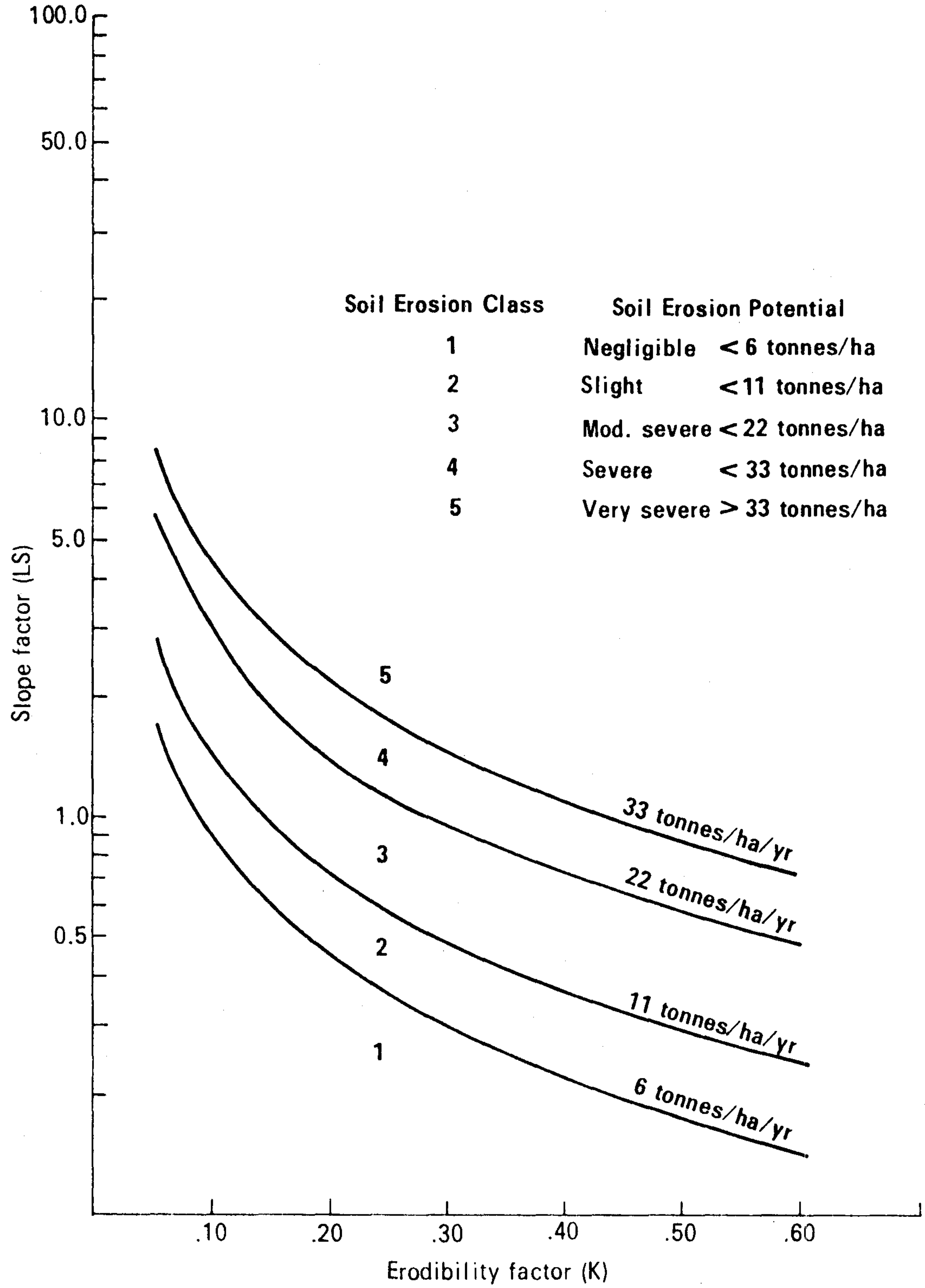

Figure 2. Soil erodibility and slope constraints for continuous corn production.

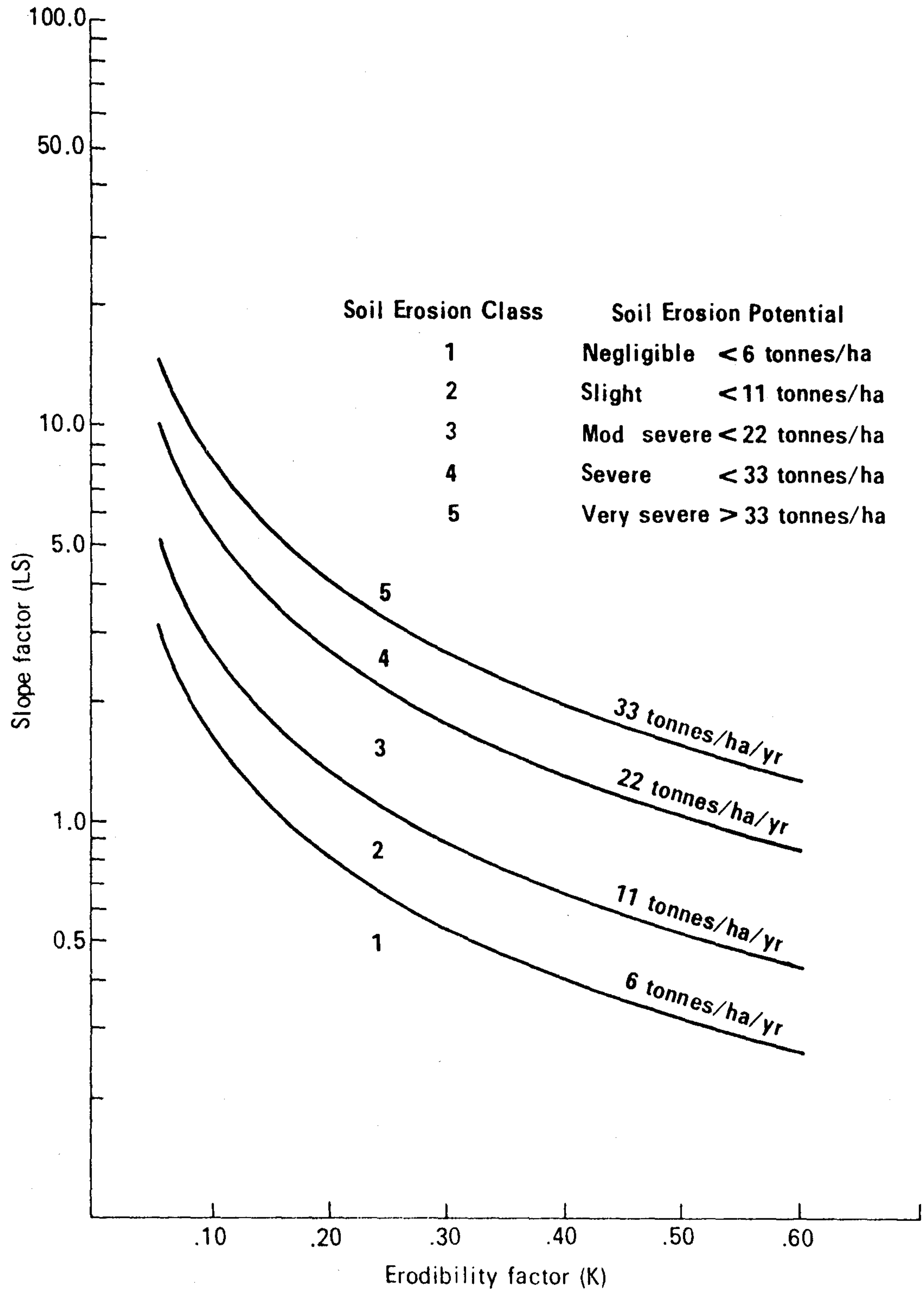

Figure 3. Soil erodibility and slope constraints on soil loss from small grain crops.

TABLE 4 - SOIL MAP UNIT - EROSION POTENTIAL

Soil Series Name	Map Unit Symbol & Slope[1]	Soil Erodibility K-Value[2]	Slope Affects (LS)[3]	Map Unit Soil Erosion Potential Class[4]		
				Bare Soil	Continuous Corn	Small Grains
Ayr	AyA	0.19	.30	2	1	1
Berrien	BeA	0.33	.30	3	2	1
	BeB	0.33	.95	5	4	3
	Beb	0.33	.46	4	3	1
Beverely	BvA	0.24	.30	3	1	1
	BvB	0.24	.95	5	3	2
	Bvb	0.24	.46	3	2	1
Bookton	BoA	0.41	.30	3	2	1
	BoB	0.41	.95	5	4	3
	Bob	0.41	.46	4	3	2
	BoC	0.41	1.60	5	5	4
	Boc	0.41	.70	5	4	3
Brady	ByA	0.26	.30	3	1	1
	ByB	0.26	.95	5	3	2
Brant*	BtB	0.42	0.95	5	4	3
	BtC	0.42	1.60	5	5	4
	BtD	0.42	4.00	5	5	5
Brantford	BaA	0.35	0.30	3	2	1
	BaB	0.35	.95	5	4	3
	Bab	0.35	.46	4	3	2
	BaC	0.35	1.60	5	5	4
	Bac	0.35	.70	5	3	2
	BaD	0.35	4.00	5	5	5
	Bad	0.35	2.00	5	5	4
	BaDE	0.35	5.30	5	5	5
	Bade	0.35	2.90	5	5	5
Brisbane	BiA	0.23	.30	3	1	1
Burford	BgA	0.31	.30	3	2	1
	BgB	0.31	.95	5	4	3
	Bgb	0.31	.46	4	3	1
	BgC	0.31	1.60	5	5	3
	Bgc	0.31	.70	5	3	2
	BgD	0.31	4.00	5	5	5
	Bgd	0.31	2.00	5	5	4
Caledon	CaA	0.29	.30	3	2	1
	CaB	0.29	.95	5	4	3
	Cab	0.29	.46	4	2	1
	CaC	0.29	1.60	5	5	3
	Cac	0.29	0.70	5	3	2
Camilla	CmA	0.23	.30	3	1	1
	CmB	0.23	.95	5	3	2

TABLE 4 (cont'd)

Soil Series Name	Map Unit Symbol & Slope[1]	Soil Erodibility K-Value[2]	Slope Affects (LS)[3]	Map Unit Soil Erosion Potential Class[4]		
				Bare Soil	Continuous Corn	Small Grains
Colwood	CwA	0.40	.30	3	2	1
Dorking	DoA	0.23	.30	3	1	1
Dumfries	DuA	0.25	0.30	3	1	1
	DuB	0.25	0.95	5	3	2
	Dub	0.25	0.46	3	2	1
	DuC	0.25	1.60	5	5	3
	Duc	0.25	0.70	4	3	2
	DuD	0.25	4.00	5	5	5
	Dud	0.25	2.00	5	5	3
	DuDE	0.25	5.30	5	5	5
	Dude	0.25	2.90	5	5	4
Fox	FoA	0.25	.30	3	1	1
	FoB	0.25	0.95	5	3	2
	Fob	0.25	.46	3	2	1
	FoC	0.25	1.60	5	4	3
	Foc	0.25	.70	4	3	2
	FoD	0.25	4.00	5	5	5
Gobles	GoA	0.25	0.30	3	1	1
	GoB	0.25	0.95	5	3	2
	Gob	0.25	0.46	3	2	1
Granby	GyA	0.13	0.30	2	1	1
Guelph	GuA	0.36	0.30	3	2	1
	GuB	0.36	0.95	5	4	3
	Gub	0.36	0.46	4	3	2
	GuC	0.36	1.60	5	5	4
	Guc	0.36	0.70	5	3	2
	GuD	0.36	4.00	5	5	5
	Gud	0.36	2.00	5	5	4
	GuDE	0.36	5.30	5	5	5
	Gude	0.36	2.90	5	5	5
Guelph sand	GsA	0.29	.30	3	2	1
	GsB	0.29	.95	5	4	3
	Gsb	0.29	.46	4	2	1
	GsC	0.29	1.60	5	5	3
	Gsc	0.29	0.70	5	3	2
Heidelberg	HeA	0.39	0.30	3	2	1
	HeB	0.39	.95	5	4	3
	Heb	0.39	.46	4	3	2
Kelvin	KeA	0.23	.30	3	3	1
	KeB	0.23	.95	5	3	2
London	LoA	0.31	0.30	3	2	1
	LoB	0.31	0.95	5	4	3
	Lob	0.31	.46	4	3	1

TABLE 4 (cont'd)

Soil Series Name	Map Unit Symbol & Slope	Soil Erodibility K-Value[2]	Slope Affects (LS)[3]	Map Unit Soil Erosion Potential Class[4]		
				Bare Soil	Continu-ous Corn	Small Grains
Muir	MuA	0.41	.30	4	2	1
	MuB	0.41	.95	5	4	3
	Mub	0.41	.46	4	3	2
	MuC	0.41	1.60	5	5	4
	MuC	0.41	0.70	5	4	3
	MuD	0.41	4.00	5	5	5
	Mud	0.41	2.00	5	5	4
Oakland	OkA	0.21	0.30	2	1	1
	OkB	0.21	0.95	5	3	2
	Okb	0.21	0.46	3	2	1
Parkhill	PaA	0.31	0.30	3	2	1
	Pab	0.31	0.46	4	3	1
Scotland	ScA	0.16	0.30	2	1	1
	ScB	0.16	0.95	4	3	1
	Scb	0.16	0.46	3	1	1
	ScC	0.16	1.60	5	3	2
Teeswater	TeA	0.39	0.30	4	2	1
	TeB	0.39	0.95	5	4	3
	Teb	0.39	0.46	4	3	2
	TeC	0.39	1.60	5	5	4
	Tec	0.39	0.70	5	3	3
Toledo	ToA	0.26	0.30	3	1	1
Tuscola	TuA	0.49	0.30	4	3	1
	TuB	0.49	0.95	5	5	3
	Tub	0.49	0.46	5	3	2
Waterloo	WaA	0.27	0.30	3	1	1
	WaB	0.27	0.95	5	3	3
	Wab	0.27	0.46	4	2	1
	WaC	0.27	1.60	5	4	3
	Wac	0.27	0.70	5	3	2
	WaD	0.27	4.00	5	5	5
	Wad	0.27	2.00	5	5	4
Wauseon	WuA	0.22	0.30	3	1	1
Woolwich	WoA	0.42	0.30	4	2	1
	WoB	0.42	0.95	5	4	3
	Wob	0.42	0.46	4	3	2
	WoC	0.42	1.60	5	5	4
	Woc	0.42	0.70	5	4	3

TABLE 4 (cont'd)

[1]Slope Gradient A = 0 to 3%, B = 3 to 6%, C = 6 to 12%, D = 12 to 20%, E = 20 to 30%

[2]K-Values as per Table 2

[3]Slope gradient and length factor (LS) as per Wischmeier and Smith (1978)

[4]

Soil Erosion Potential Class	Potential Annual Soil Loss tonnes/ha/yr
1	<6
2	6 - 11
3	11 - 22
4	22 - 33
5	>33

Site Specific Assessment of Soil Erosion Potential

Figure 4 represents a soil erosion nomograph that was designed to facilitate site specific assessment of soil erosion potential. The nomograph may be employed with information contained in the Brant County soil survey report to assess potential soil loss for various crops and slope conditions, as well as for different soil conservation practices.

The nomograph represents a graphical solution of the universal soil loss equation for the soils of Brant County. Potential soil erosion losses for a site can be obtained as follows:

a) determine the soil erodibility value from the soil survey report. The nomograph (Fig. 4) illustrates the relative K-values of well drained soils in Brant County at the appropriate position on the erodibility axis;
b) determine LS value from on-site evaluation of slope gradient and slope length. Use LS chart (Wischmeier and Smith, 1978) to arrive at LS value;
c) draw a line between the site specific K-value and LS value to determine the intercept with the pivot line (Fig. 4);
d) site specific soil loss potentials for all the land uses listed on the nomograph may be determined by drawing a line from the land use under question, through the soil-slope intercept on the pivot line to the potential soil loss axis.

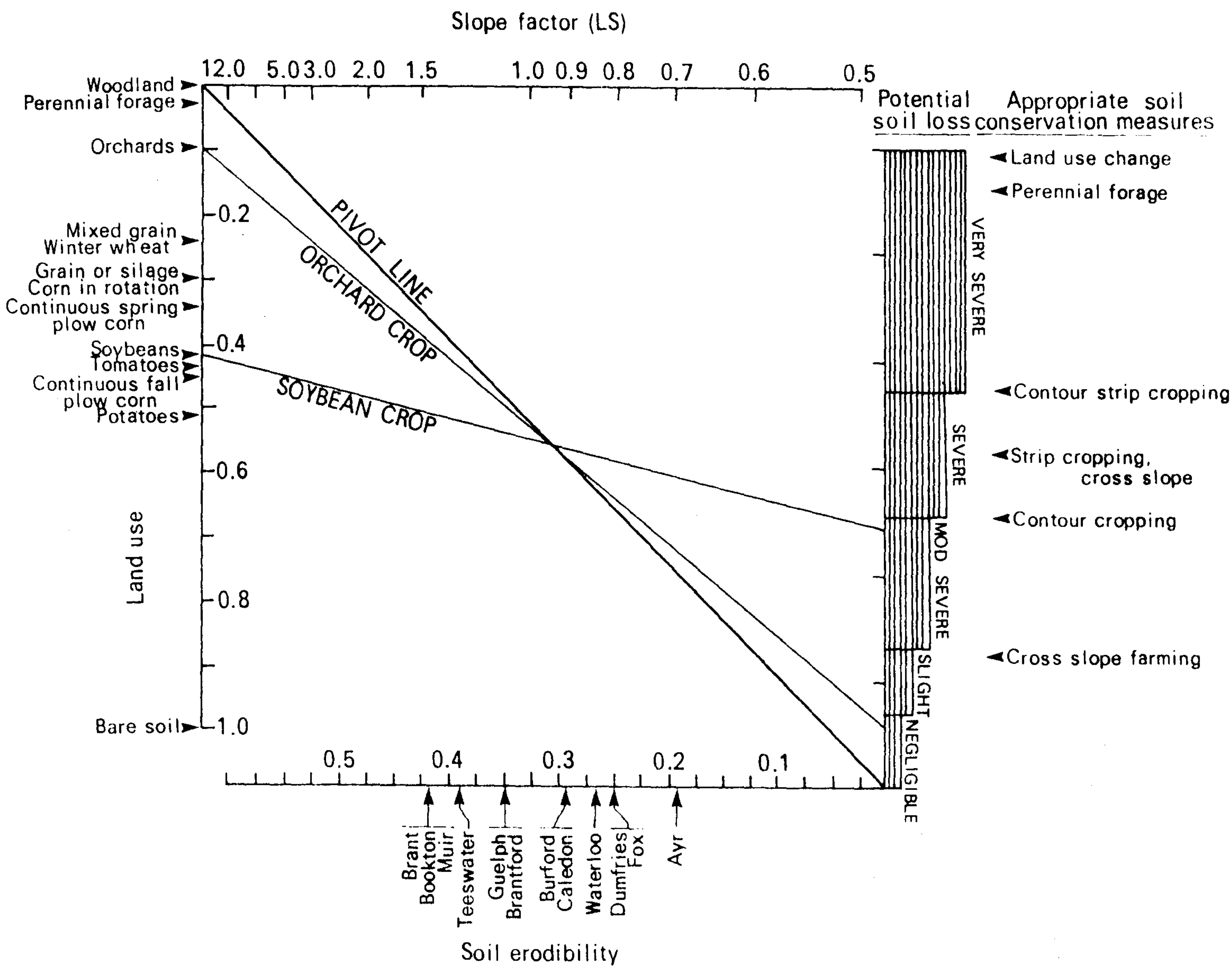

Figure 4. Prediction of cropland erosion potential and some control alternatives.

A sample calculation is illustrated as follows:
Soil K-value - Caledon soil = .30
Site LS factor = 1.0 Draw a line between K and LS values and find the intercept with the pivot line. What is the potential soil loss for these soil and slope conditions for: a) a soybean crop and b) an orchard crop?

A line is drawn from the soybean and orchard crop values located on the land use axis through the intercept on the pivot line to cross the potential soil loss axis. The soybean crop grown on these soil and slope conditions has a moderately severe erosion potential, while the orchard crop has a negligible soil loss potential.

The soil erosion nomograph provides a rapid method to assess the effect of many land uses on soil loss potentials for site specific soil and slope conditions. By altering the LS factor to reflect different slopes lengths, the soil erosion nomograph can also be useful to test field consolidation alternatives that minimize soil loss potentials. The soil erosion nomograph (Fig. 4) in combination with soils information from the Brant County Soil Survey Report can provide much information for farm soil conservation planning in the future.

Soil Erosion Maps - CanSIS Generated

Since the soils map for Brant County is not yet digitized it has not been possible to provide samples of CanSIS generated soil erosion maps. However, a small land area adjacent to Brant County, but recently annexed into Waterloo County was selected to illustrate the nature of soil erosion maps that can now be produced through CanSIS. The soil map of the area annexed by Waterloo Region contains many of the same soils as Brant County, and has also been recently digitized.

Soil erodibility values for each soil series were computed and a single factor map depicting either soil erodibility values (K), or soil erodibility classes. In addition, single factor maps depicting the erosion potential of soil map units under unvegetated conditions and corn cover were produced.

Samples of these maps are attached as appendices of this report.

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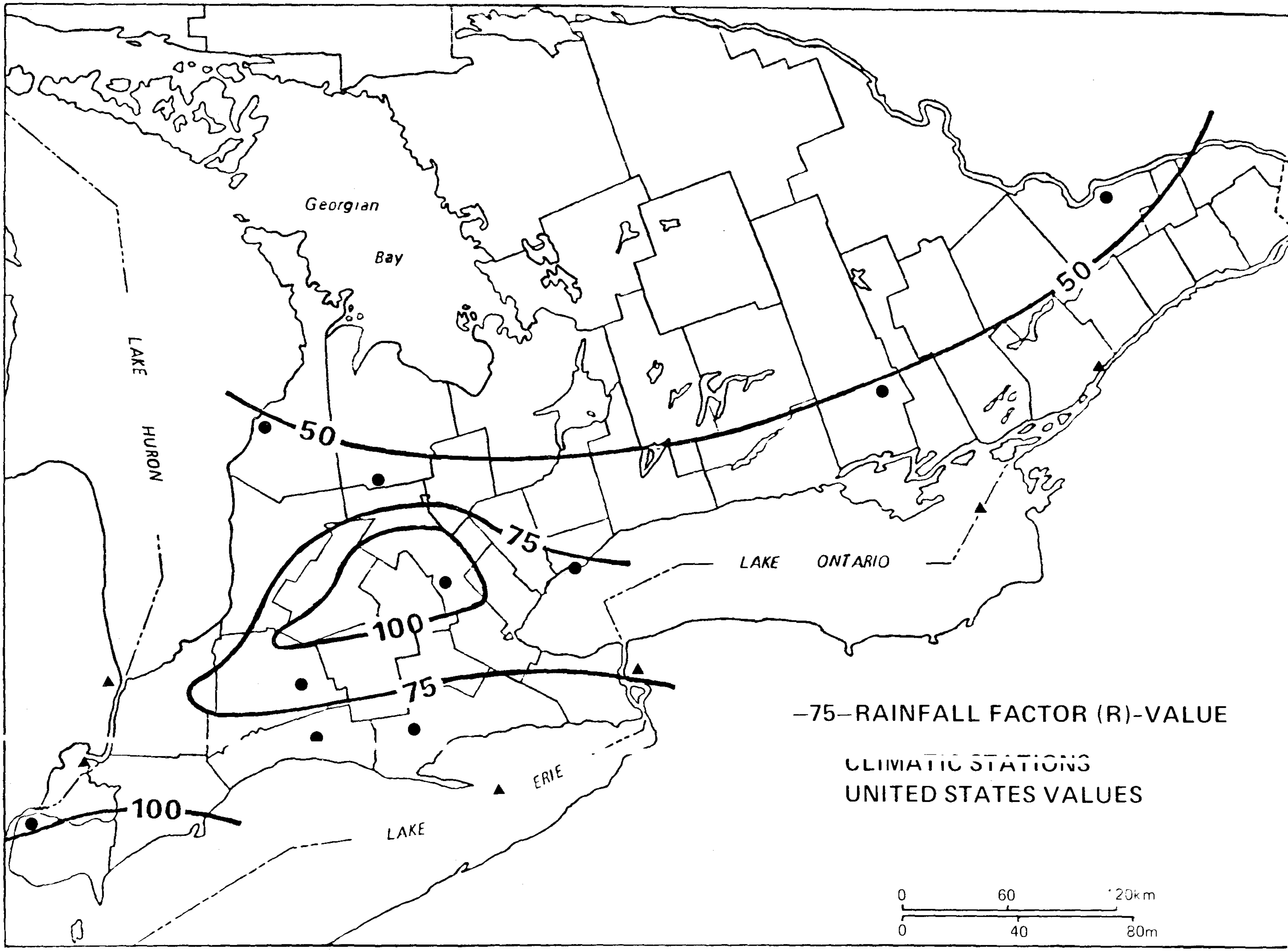
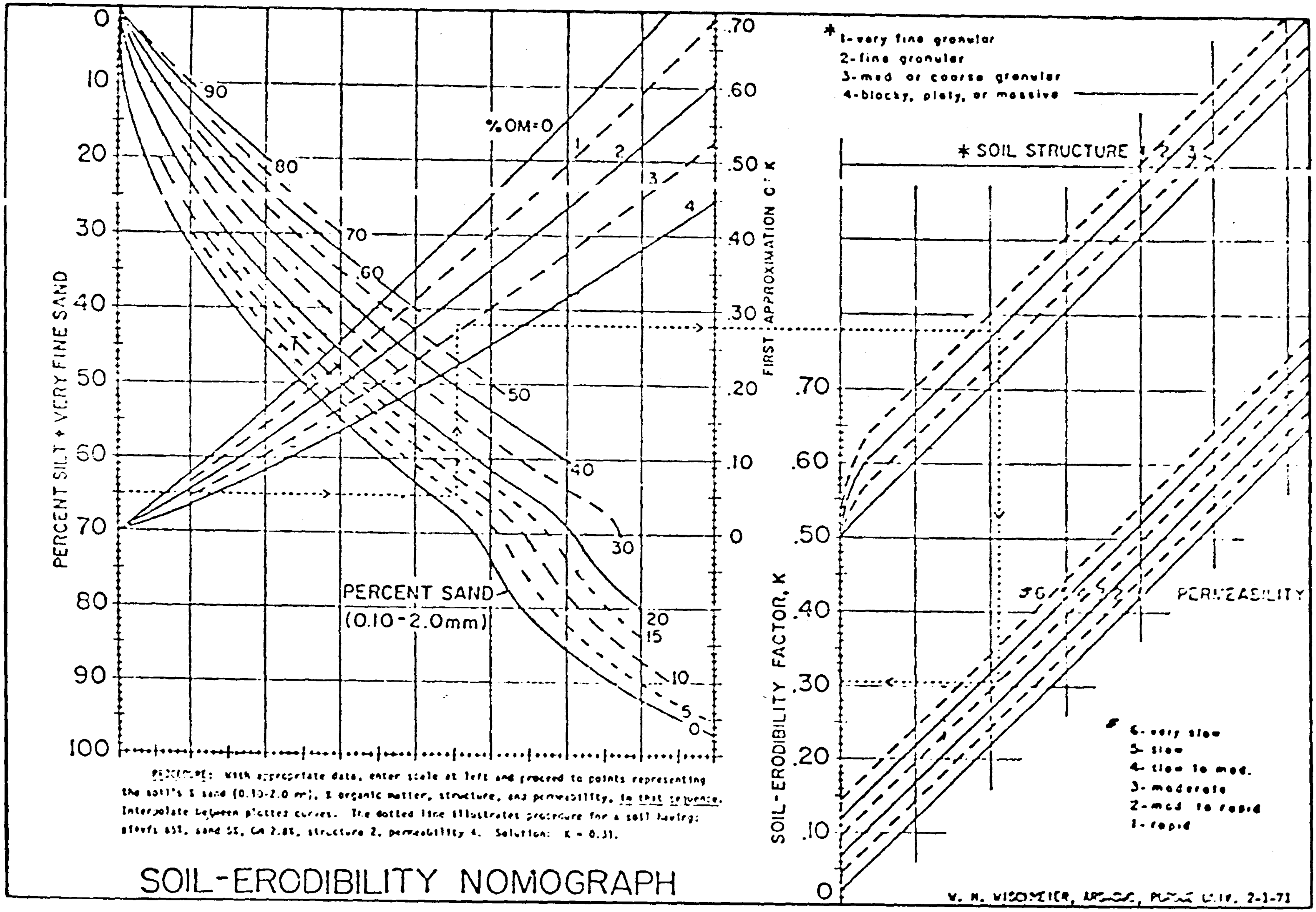
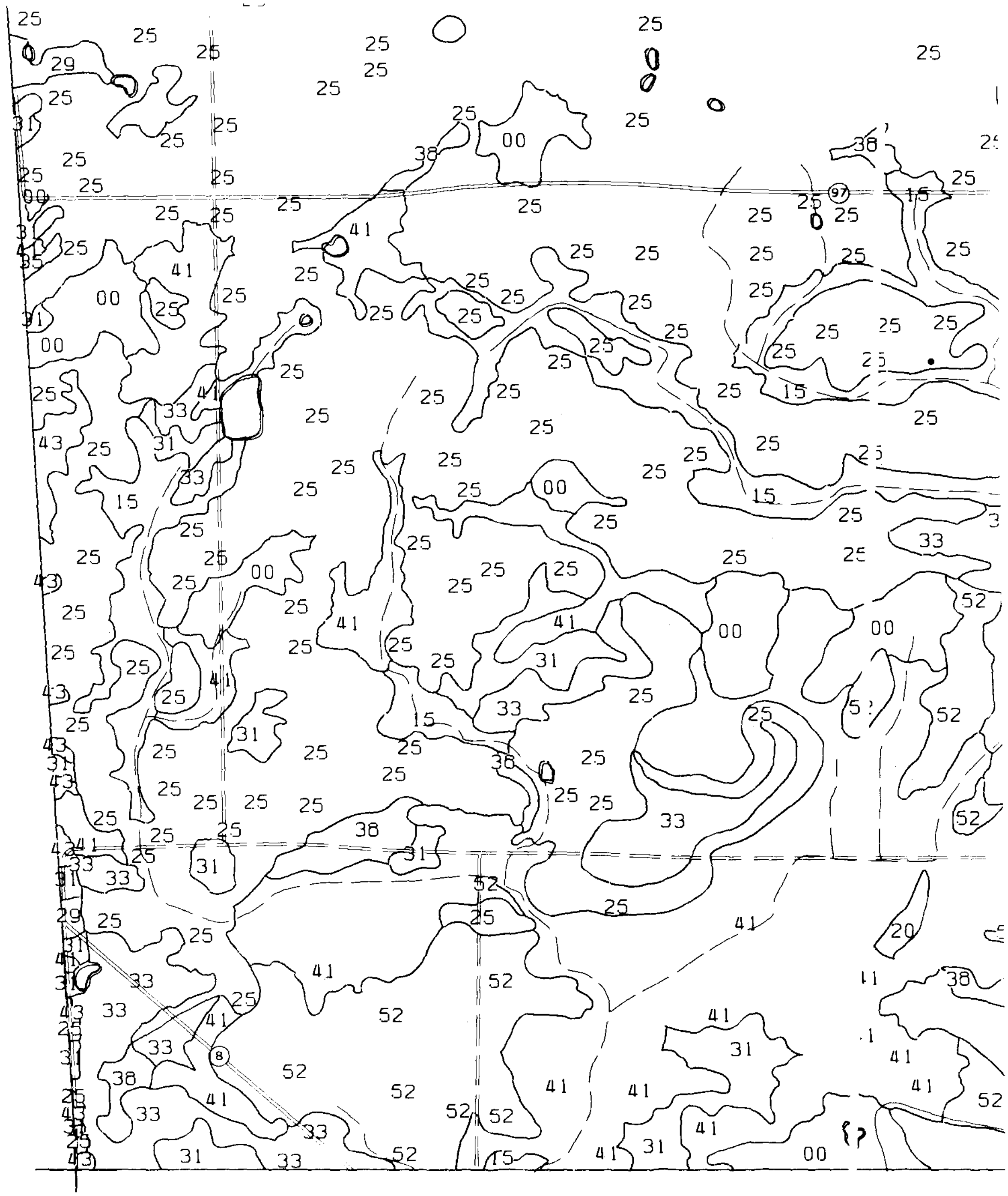


APPENDIX 1 - RAINFALL FACTOR "R" FOR SOUTHERN ONTARIO



Appendix 2 - 1971 Journal Soil and Water Conservation 26:189-193



SOIL K-VALUES AS PERCENTS

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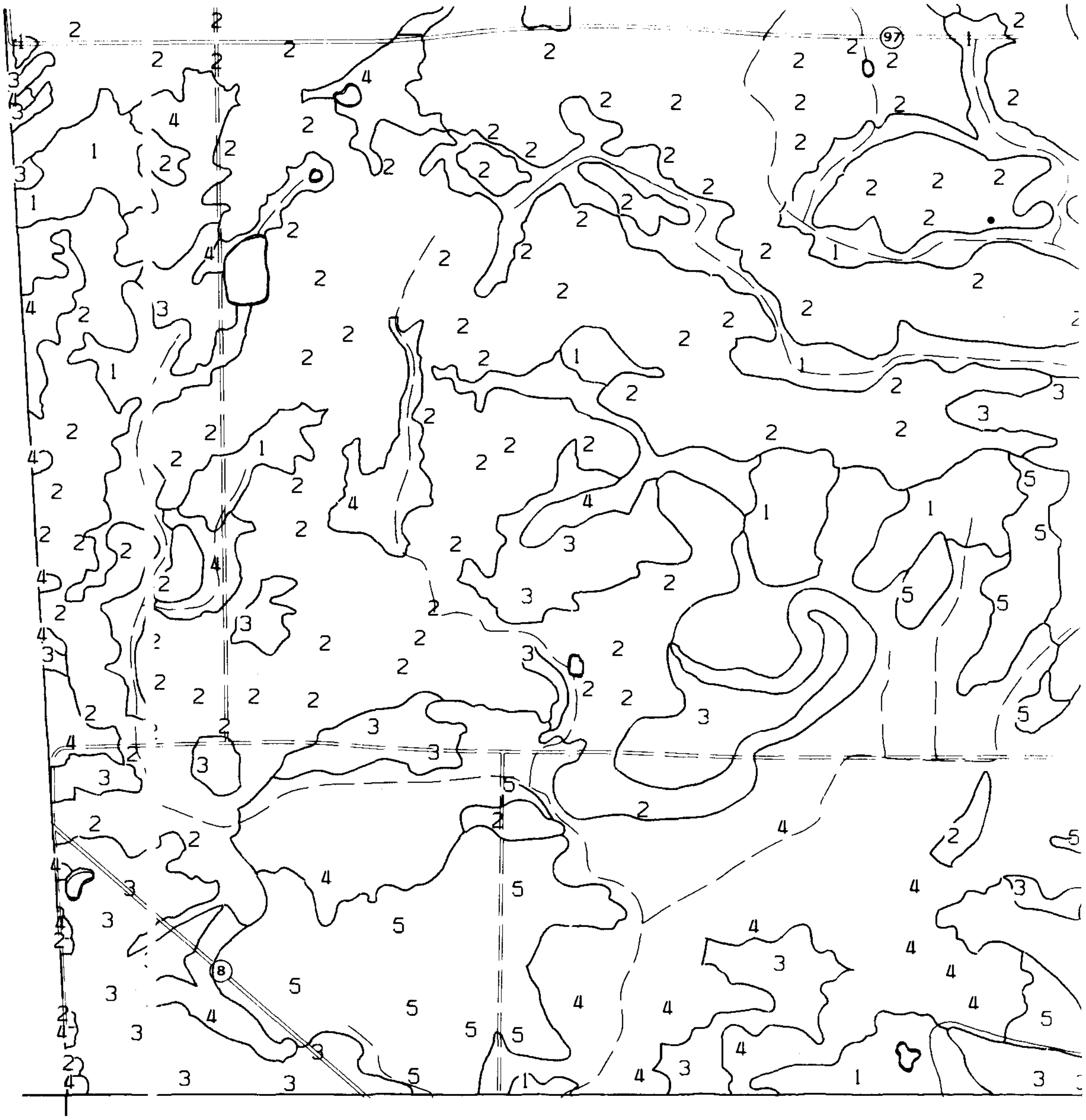
WATERLOO COUNTY EXTENSION ONTARIO
SCALE 1-20000

GJW800129



SOIL ERODIBILITY POTENTIAL CLASSES

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WATERLOO COUNTY EXTENSION ONTARIO
SCALE 1-20000

SOIL ERODIBILITY CLASS	K-VALUE	EROSION POTENTIAL
1	0-.15	NEGLIGIBLE
2	.15-.30	SLIGHT
3	.31-.40	MODERATELY SEVERE
4	.41-.50	SEVERE
5	.51-	VERY SEVERE

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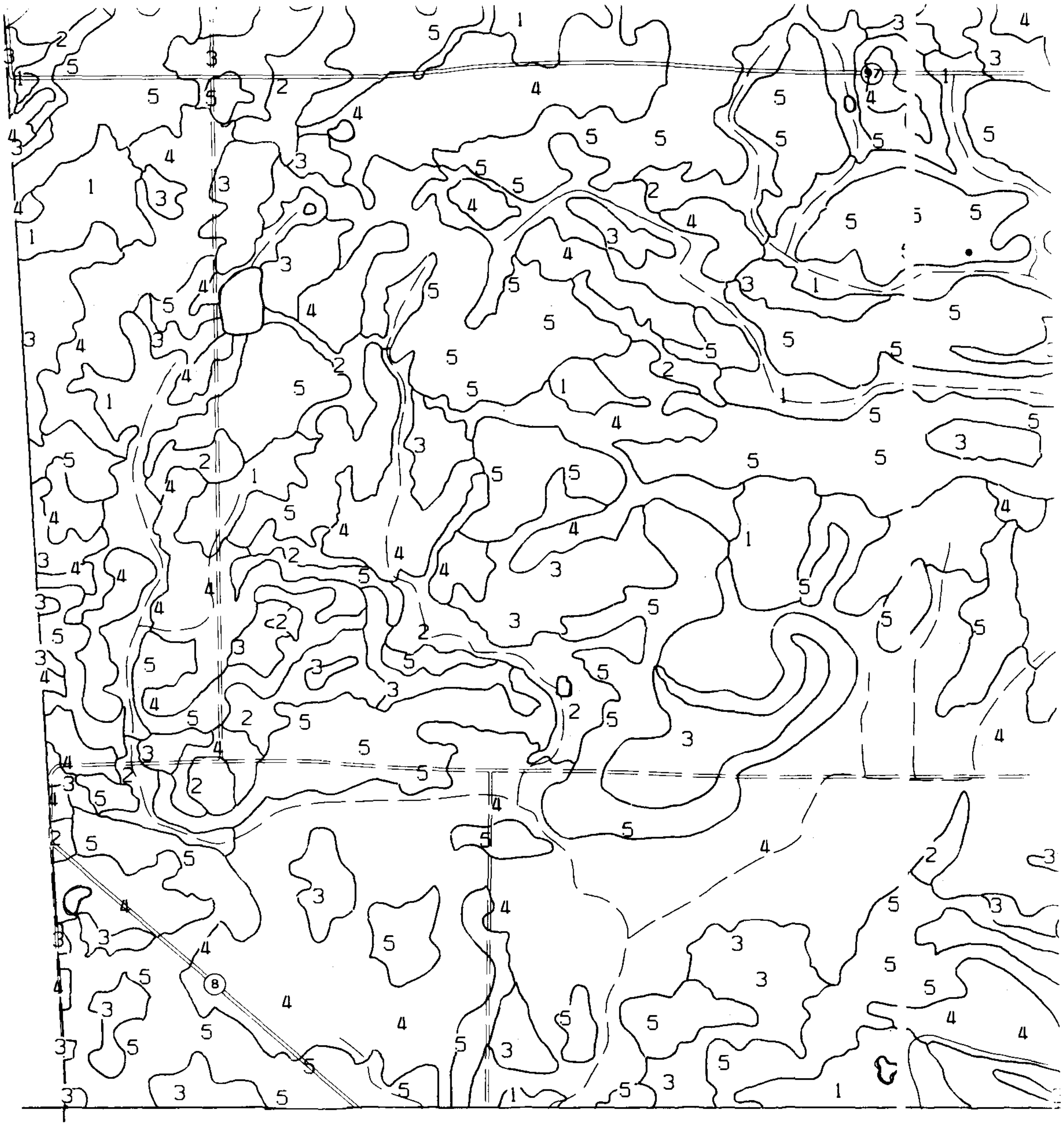
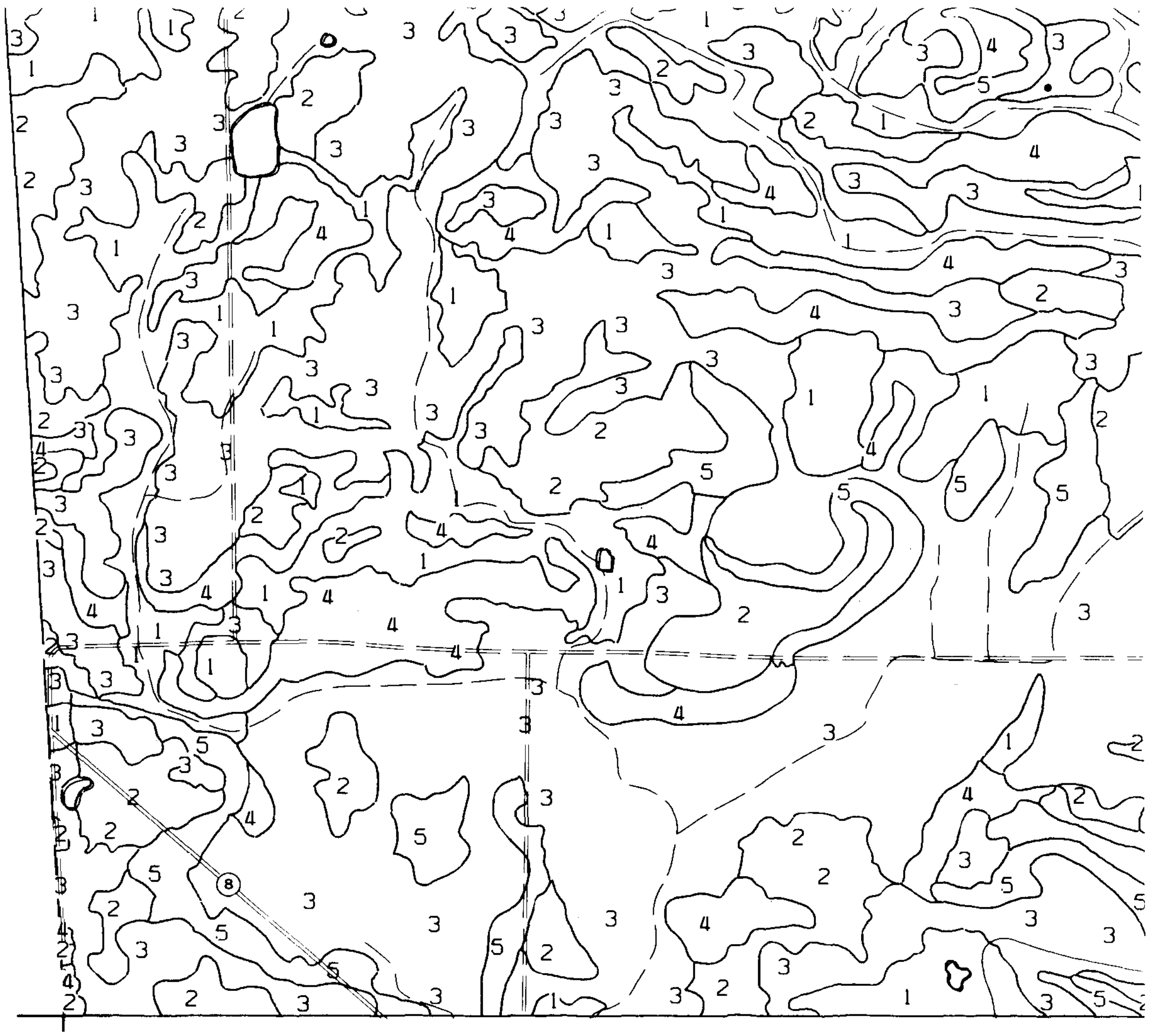


MAP UNIT EROSION POTENTIAL CLASSES

FEB 11, 1981 10:23 PM

WATERLOO COUNTY EXTENSION ONTARIO
SCALE 1-20000

CLASS	EROSION POTENTIAL		
1	NEGLIGIBLE	<6TONNES PER HECTARE	
2	SLIGHT	<11TONNES PER HECTARE	
3	MODERATELY SEVERE	<22TONNES PER HECTARE	
4	SEVERE	<33TONNES PER HECTARE	
5	VERY SEVERE	>33TONNES PER HECTARE	GJW800129



SOIL EROSION POTENTIAL CLASS FOR CORN CROP

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WATERLOO COUNTY EXTENSION ONTARIO
SCALE 1-20000

CLASS	EROSION POTENTIAL		SOIL CONSERVATION RECOMMENDATIONS
1	NEGLIGIBLE	<6TONNES PER HECTARE	NORMAL GOOD MANAGEMENT
2	SLIGHT	<11TONNES PER HECTARE	CONSERVATION TILLAGE CROSS SLOPE CULTIVATION
3	MODERATELY SEVERE	<22TONNES PER HECTARE	STRIP CROPPING FIELD LENGTH
4	SEVERE	<33TONNES PER HECTARE	CONTOURING TERRACES
5	VERY SEVERE	>33TONNES PER HECTARE	CONSIDER OTHER USES

GJW800129

Comparative Evaluation of two Methods

of Preparing Soil Interpretations

J.H. Day

During 1980, selected survey groups were requested to participate in an evaluation of two different methods for presenting to the public interpretations of soil information for a number of uses based upon (1) G. Wilson's Pedotechnique instruction book as a guide, (2) U.S.D.A. rating sheets and "Guide to Engineering Interpretations" or local modifications thereof. It was proposed that each survey group present documents produced by each of the two methods to a local planning authority or "engineering" group. These "users" were to be requested to evaluate each of the methods and to indicate their success in understanding the utility of the materials and relative preference for one or the other of the methods.

The survey groups were further requested to report at a March 1981 workshop their experiences in preparing, presenting and evaluating user responses under the following headings:

1. The ease with which the surveyor could understand and apply the instruction manual/reference source supplied.

2. The time required to complete the diagrams, tables, maps or whatever for the interpretation requested.

3. The presentation of materials by the team to local planning authority or "engineering" groups: their level of comprehension and interest, the ease of presentation of each method to those persons.

4. The evaluation of the materials and methods by the planners and engineers: did they like and ask for more etc. Possibly rate on scale 1 unacceptable to 5 enthusiastic reception.

5. Other important observations not covered in the above list.

6. Summary recommendations of the survey team. Be frank please.

The reports of each of the soil survey groups follow. Two persons not involved in the testing process were requested to serve as cochairmen at the working group session. They were D.F. Acton and W.W. Pettapiece. Their summary report and recommendations follows the survey group reports; the charge given them is included in their report.

Manitoba Evaluation

W. Michalyna

A comparative evaluation of two methods of presenting soil information and interpretation, namely the USDA and pedotechnique approach was undertaken via the "other than pedologist or agrology" route in order to obtain a response from potential users of soil information such as engineers and planners. This situation has arisen due to the recent proposal by Wilson on Pedotechnique with Guidelines for presenting soil interpretations 1979 and revised version 1980. As reported by Wilson, this format would bring relevant soil properties into a form that should be readily understood by engineers, and illustrated guidelines would enable interpretations to be made or understood by planners or other users.

Background

A general review of Wilson's first draft of Pedotechnique was undertaken by pedologists of the Manitoba Soil Survey and reported by Smith in a formal reply in November, 1979. In May, 1980, a request from Day (Ottawa) to the Manitoba Soil Survey to participate in a USDA-Pedotechnique evaluation was received; this request was presented at a meeting of the pedologists and the merits discussed. Since the pedologists had previously reviewed the Pedotechnique, it was discussed that further participation in the proposed evaluation would take considerable time and effort by two individuals; there was reluctance to undertake this task. Since I had indicated that the pedotechnique should be exposed to and evaluated by engineers and planners and not judged solely by pedologists, the task to solicit reaction from the other disciplines was passed to me.

Approach

Approximately 25 technical engineers and planners were contacted by phone to determine their knowledge of, or use of, the Soil Survey reports. During the phone conversations, an attempt was made to determine their degree of familiarity with the Soil Survey maps and reports and to establish their interest in the Soil Survey program, interpretations and pedotechnique.

A meeting was arranged with nine engineers (or firms) and three planners who either indicated familiarity with or an interest in the Soil Survey Activity. Since the engineers had not seen the more recent survey reports, 1971 to present, and were only slightly familiar with some of the Reconnaissance 1:125,000 maps and reports, the primary role was to acquaint them with the Soil Survey activity, to provide some background on the pedological approach to mapping, and to discuss soil properties; the secondary role was to compare the methods of presenting engineering properties by using selective examples from various soil reports and information compiled for pedotechnique. The comparisons of format were presented using the engineering data sets from:

a) USDA approach as in reports prior to 1977,
b) modified USDA as in recent reports 1978 to present, and illustration of derived interpretive maps,
c) pedotechnique as proposed by Wilson.

During the meeting with the respective engineers, the approach was to present the information on an informal basis and allow maximum dialogue and exchange of information or clarification. Information was left with the engineers or planners. Follow-up sessions were arranged for those individuals or groups that indicated an interest and appeared to understand or assimilate the information.

The replies on the two approaches are provided according to suggested headings as follows:

1. Ease of understanding the USDA approach and Pedotechnique

Firstly, the USDA approach has been used in Manitoba since the late sixties and early seventies; interpretive tables have been included in reports commencing with interpretation for recreation uses - Lac du Bonnet report, 1967, and engineering-recreation uses in the Grahamdale 1971, Morden-Winkler 1973, Portage 1974. An engineering and recreation section have been included in most soil survey reports to date. The pedologists with the Manitoba Soil Survey have become familiar with the USDA approach and format, and have participated in the update of guidelines as presently reported in the appendix of most recent reports published in the last few years.

The Pedotechnique Approach was not difficult to comprehend or understand, but took some time to interpret the graphic guidelines for the interpretations. Because of the background for the USDA approach, parameters or guidelines were inferred or related. There was no attempt to evaluate the graphic guidelines of pedotechnique in terms of their specific replacement for the modified USDA guidelines as presently used in Manitoba.

2. Time required to complete diagrams and material for the comparative evaluation

The main intent was to portray information and interpretations according to the Pedotechnique format (the full details were not attempted, rather sufficient data was provided to convey the concept and approach).

Items prepared:

a) general schematic of a part of a map - Gimli (½ section)
b) bases of two mosaics to put interpretive information on
c) xerox portions of pedotechnique to illustrate the approach
   - pedotechnical layers
   - resource material sheets
   - graphics for interpretations
d) preparation of the pedotechnical setting documents, and plotting the available analytical data.

It is difficult to put a preparation time on these various tasks, since a complete package, as initially suggested, was not attempted. An estimated time for the study of the document, preparation of sketches, interpretive maps, and setting documents was approximately three weeks; contacting engineers and planners, meetings, xeroxing of additional materials, participating in lectures - six weeks.

3. Presentation of material to Planning or Engineering Groups: their level of comprehension and interest

Soil Survey reports, detailed mapping, soil interpretation for engineering (USDA) and pedotechnique were presented to engineers and planners; in general, the planners were more acquainted with the Soil Survey reports and the interpretation than the engineers.

Technical Engineers

Some technical engineers had referred, had seen, or used the older reconnaissance reports and obtained the general information on material and landform from the legend on the maps; they were not familiar with the written information. The engineers were not aware of the recent soil survey information that contained the engineering section and interpretations.

A few engineers indicated that the soil reports were in their library - provincial agencies but had not referred to them; they were not aware or had not worked with the information to determine what practical use could be made.

Engineers from two consulting firms indicated that the company had the older reports; on any project, the reports were one of the first to be perused to determine the general terrain, drainage and accessibility.

During the presentation of the information to engineers, they wanted to know about the Soil Survey program, number of staff, educational background and experience. Most engineers were interested in the soil information from a general setting viewpoint.

Level of comprehension: technical engineers indicated that their formal training did not expose them to pedology, chemical or physical soil properties and terrain characteristics.

The engineering tables were understood readily; engineers were able to translate the map symbol to properties as indicated in the general properties for engineering, or the written format for interpretations; they did not appreciate the interpretation rated good to very poor at this time, nor the guidelines for making interpretations.

Pedotechnique was viewed as a new language for the technical engineers. After explaining the mapping process and the grouping of materials into associations, the engineers could not appreciate the concept of pedotechnical layers; only a few (highway) engineers were receptive to the information presented in the pedotechnical setting document but questioned the need for all the properties listed since many pertain to on-site design criteria, rather than general parameters related to geographic soil delineation. Many questioned the need for a large number of setting documents, which would involve considerably more time to obtain information as compared to tabular format. The majority suggested that one or two cross sections through portions of the map would suffice with information showing stratigraphy and materials, drainage symbols, explanation of map symbols. They preferred the data in table format. They indicated that once they became familiar with the general format of our reports, they could obtain information satisfactorily.

The pedological language was a new experience for the engineers, but not the terminology on materials if expressed in geological or engineering terms.

Planners

Municipal and consultant planners were interested in more exposure to the soil survey information and were interested in the pedotechnical approach. Planners do not require the technical information since they do not have the background nor experience to work with the technical data. They prefer the interpretive sections particularly the "readily understood" and generalized information on soil type, composition, drainage, and development capability (building sites and septic field). This information is preferred in tabular form; planners would select those interpretations that would apply to the particular project.

Level of comprehension is good; planners know their limitations in terms of soil knowledge and make maximal use of information such as surface deposits, drainage and some of the specific interpretations such as building sites and septic field.

Ease of presentation of each method

Most technical engineers were skeptical at first since they associate soil survey and pedology in relation to profile development or agricultural surfaces which are generally 30 to 50 cm depth; many of the initial comments by engineers imply that they associate our information as the upper layers that they ignore or scrape away prior to any investigation or use. Following more detailed explanation of the soil survey activities of material characterization of 1.2 m or more, or up to 3 m or more for specific projects, their comments during discussions often implied the upper surface.

Few engineers appreciated the concept that delineated areas on a map with the same (map unit) symbols have similar properties and will behave similarly. Presentation and discussion was organized to convey soil material and the expression of active processes (solum or profile) on these materials.

Planners were receptive to the interpretive aspects of both USDA and Pedotechnique approach. There were no problems of presentation of either method to the planners.

4. Evaluation of the materials and methods by engineers and planners

Engineers

Engineers were reluctant to provide much comment or criticisms since they were being introduced to new methods and terminology. At the beginning, there was skepticism as to the methods used to determine some of the engineering properties and the relationship of these properties to geographic areas. Engineers who indicated that they wanted to review the information and participate in a second or third meeting, provided the following verbal evaluations.

In comparison of the two approaches, the USDA approach was favored. With Pedotechnique, the engineers felt that they had to learn a new language and format since the proposal of pedotechnical layer and the modules do not conform to presently used formats by engineers. They indicated that one or two general cross sections from the map would suffice to convey the information of map symbol, geographic area, landform, stratigraphy and relationship of some of the soils in a landscape. Engineers preferred the tabular format of data presentation; they expressed that it was relatively easy to proceed from the map to the tables. They also expressed that with more familiarity and use, particularly if related to a geographic area of concern, they would easily be able to extract the general information related to engineering. They are impressed with the amount of information on "geotech setting" provided in the more recent reports.

Engineering interpretations were interesting, but most engineers were not in a position to comment; they felt they required considerably more time to be able to evaluate this aspect of soil survey activity. Interpretive maps of "soil drainage" (term somewhat vague to them at this time) and soil classification by Unified system could be useful. The generation of these types of soil parameter maps by the CanSIS system was of interest.

One engineer who took considerable time to compare the tabular interpretation formats preferred the written statements on "factors affecting engineering use" (Winnipeg Region Report, 1974) rather than a good (G) to very poor (V) rating interpretation as provided in the more recent reports (Rockwood Study, 1980). At this stage, the tables with the written statements that affect a particular use offer more than the interpretive table with a good to very poor rating and a subscript to indicate main soil limitations; with increased knowledge of the system, and familiarity with the guideline tables included in the Appendix, this viewpoint may change.

The general opinion regarding the graphic guidelines for interpretation on resource materials, permanent building and septic fields was "these appear as design criteria"; engineers wanted to study these graphic criteria in relation to other information and would consider additional sessions of explanation at some time in the future.

Engineers expressed a reluctance to provide an assessment of the information presented since a considerable amount of unfamiliar data, formats and interpretations were put forth in a relatively short time.

Planners

Planners expressed a requirement of easily obtained, readily understood and generalized information on soil type, composition, drainage and development capability. They are not trained or equipped to interpret most of the specific soil characteristics affecting land use planning and development. The Pedotechnical setting document and modules were interesting, but most of the information would not be useful to planners, unless they have some understanding and appreciation for the more technical aspects of soil survey. There are a few aspects of the pedotechnique setting document that would aid some planners (municipal planners) in understanding an area of concern; these are the landscape sketches of typical associations and the water regime characteristics.

Interpretive information is preferred in tabular form since the synthesis needs will vary from project to project. Planners need to move between different scales, which may not be compatible with the derived computer map. However, selective interpretive maps such as drainage, permanent buildings and septic field would be useful. A complete package of derived or interpretive maps are not required for planning purposes; planners would prefer that derived or interpretive maps could be ordered separately as required; they were pleased with the capability of the CanSIS system.

Planners did not differentiate between interpretations of the USDA or Pedotechnique approach. The rating of unlikely, possible and probable is a reasonable way of rating for a particular use if the soil survey chooses to adopt this format. The terms would appeal more to the user and the public if incorporated within the interpretations; the use of a dash -, and the prime 1
as part of the symbology was not acceptable since it could easily be misinterpreted or lossed in the transfer. They suggested that symbology presently used for good to very poor could be utilized, but redefined to include the unlikely (G), possible (F), probable (P) and very probable or highly probable (V).

The graphic guidelines to compliment the present tabular guidelines would help to convey some of the important limitations. The subdivision of the interpretation for Permanent buildings into Excavation, Flooding, Heave or Uplift, Settlement factors and for Septic Field into Depth of Soil Filter, Nutrient attenuation, Setting and Slope were considered favorably, and possibly should be separate headings under permanent buildings and septic field with appropriate symbology other than the - or the prime.

The coding system with letter and subscripts is favored over the former approach where written information was provided in tabular form (non-modified USDA approach).

It was emphasized by the Municipal Planning Branch that "when major changes in the format of reporting soil survey data take place, we would stress the importance of familiarization and orientation sessions/workshops for our staff in order to fully understand the new format".

5. Other Observations

Engineers expressed a need to increase the communication between the disciplines since most geotech engineers were not aware that soil and interpretive information was available; they suggested that a short note in the Association of Professional Engineers of Manitoba (APEM) bulletin or contacting the local Canadian Society of Civil Engineers and Canadian Geotechnical Society will help to inform local engineers.

Prof. A. Baracos, Geotech Engineer, University of Manitoba, indicated that there is an increasing need to understand the physical-chemical relationships, structure, mineralogy, hydrological and climatic factors that influence the stress, shear, pore-water and cohesion properties of materials. Because of the variability of soil materials and environmental factors, often over short distances, it is difficult to establish boundary condition for design. Problems in construction and service industry in the Winnipeg area are not only associated with the high shrink-swell clays, but clay-silt stratigraphy, salt content and gypsum, change in structure of soil (slickensides and cracking to 5 meters or more) and frost heave are a few that have been emphasized.

Many engineers have the concept that the term soil in the agricultural discipline consists of the agricultural layer and immediate root zone. They generally were not aware that pedologists characterize subsoil materials.

Engineers have expressed some difficulty in understanding such particle distribution terminology as loams, loamy, medium coarse loamy; in some cases, loams have been interpreted as the surface layer containing the organic material regardless of particle distribution. A "texture" diagram as on the pedotech setting document with family particle size terms, in conjunction with "floating VFS" was very confusing to the engineers.

Engineers were subjected to a vast quantity of information which was presented in "unfamiliar format and relatively new language" and asked to make some judgements. The comments provided within this report reflect the opinion of those engineers that had some knowledge of the survey information and sufficient interest. My personal impressions are that the information and judgements that they provided will not change for a considerable period of time.

Summary and Recommendations

A considerable time and effort was taken to expose engineers and planners to the Soil Survey information and to solicit comparative judgements on USDA and Pedotechnique Approach to communicate data and interpretations for engineering and recreational use.

In general, the USDA approach was more acceptable to both engineers and planners. Most engineers did not approve of the pedotechnical setting document for conveyance of soil survey data to engineers; a) they indicated that the format and modules did not conform to any formats presently used by engineers, b) they did not want to learn a new language. Highway engineers expressed some merit of the landscape setting, water table and grain size; the other modules were not favored since they were considered in the design criteria category and not general properties. Engineers reserved comment on the interpretive guidelines/graphics and interpretations; drainage and soil classification (Unified) maps could be useful.

Planners preferred interpretive data in tabular form and were pleased with the interpretive map capability of CanSIS. They do not favor mass production of interpretation maps but for some of their projects, would prefer to "order" selective interpretations. Selective portions of the pedotechnique setting document would be informative, particularly the landscape setting and water table module on selected soil associations within a project. Interpretive terms unlikely, possible, probable has user appeal; the codes were not acceptable. They reserved comment on the pedotechnique guidelines, The subdivision of Ratings for Permanent Buildings (USDA) into four headings under Dwellings (Pedotechnique) - Excavation, Flooding, Heave, Settlement, was considered favorably. Similarly, the subdivision of the Septic Field (USDA) into three headings under Septic Tanks (Pedotechnique) - Depth of Soil Filter, Nutrient Attenuation, Setting and Slope were also favored.

Recommendation

It is recommended that the USDA Approach to engineering and recreational data presentation and interpretations be retained and modified over time to incorporate some of the acceptable or favorable ideas from pedotechnique.

British Columbia Evaluation

T. Vold, P. Daykin and D.E. Moon

As requested by the Expert Committee on Soil Survey, two approaches to providing engineering interpretations based on soil survey information were assessed in British Columbia. The assessment was comprised of three basic steps. First, the U.S. Department of Agriculture's "Guide for Interpreting Engineering Uses of Soils" and the proposed Agriculture Canada's "Pedotechnical Interpretation System for Soil Surveys in Canada" were reviewed by a soil surveyor relatively unfamiliar with either system.

Second, selected soils in Northern Vancouver Island were described and interpreted using both systems with example interpretive maps prepared. Finally, this material was presented to nine engineers and nine planners to determine what they liked and disliked about each approach.

The findings from this evaluation are presented under the six headings proposed for discussion purposes:

1. The ease with which the surveyor could understand and apply the instructions manual supplied.

In general, an equal effort was required by the surveyor unfamiliar with either system to understand the material in the respective instruction manuals. Procedures are reasonably well-documented in both manuals. Specific comments here include:

(a) The pedotechnique approach includes an example of its incorporation with data from the Nepean-Gloucester soil survey - an added bonus.

(b) The tables of the USDA system are intuitively easier to understand (in terms of how to fill them out), while the Pedotechnical setting document of the alternative approach requires explicit examples of how to fill out each graph or module.

(c) The interpretation guide sheets of the Pedotechnique approach are harder to comprehend initially, but when familiarity is gained, easier to use (than are the USDA guide sheets).

(d) Most surveyors, however, are already familiar with the USDA manual and thus extra effort will be required of surveyors if the Pedotechnique approach is adopted.

2. The time required to complete the diagrams, tables and maps for the interpretation requested.

There was no significant difference in the amount of time required to complete the whole process of preparing interpretations via each method - from the data presentation through drafting of the interpretive maps. There were some differences at the various stages:

(a) data presentation. Here the pedotechnique approach took longer because i) graphing all the parameters of a soil was harder than listing them in a table; ii) it took time to look up chemical data from laboratory analysis; and iii) it took time to prepare a cross-sectional diagram. Chemical data could have been listed for the USDA table, but were omitted because they weren't used for the interpretations.

One very time-consuming process for both methods was looking up grain-size distribution data and assigning AASHO and Unified soil classes. Procedures for doing this are not included in the pedotechnique manual.

(b) interpretation procedures. A negligible time difference here, although the pedotechnique method is slightly quicker because of the unambiguous factor-by-factor assignment of symbols.

(c) interpretive maps. The pedotechnique symbols are more complicated and hence represent a slightly larger time commitment.

Besides the time required to complete the interpretive process, of concern to surveyors is the number of pages (or length) of each procedure. The difference in the two approaches, in this regard, is with respect to data presentation. A separate pedotechnical setting document is required for each soil described in a survey area, whereas in the USDA approach, a descriptive table containing several soils can occur on each page.

3. The presentation of materials to planners and engineers: their level of comprehension and interest, the ease of presentation of each method to those persons.

The planners and engineers interviewed were reasonably familiar with soil maps and their use. Although interested in soil conditions affecting use, they realized that soil information is but one important input. Also, most understood that soil maps are generally of insufficient detail to be used for site-specific problems, and should be used at the early stages of planning.

Of the two approaches, the USDA method was initially more understandable to all planners and most engineers interviewed. The reasons were that it is simple, many were already familiar with it, and it was a little easier to explain.

After thought and discussion, however, some planners and engineers opted for pedotechnique, or aspects of that approach. Nearly all planners and engineers felt they could use and would make use of either system. As professionals they felt obligated to make use of whatever data exists.

Ensuring that soil information is available to planners and engineers was perceived as more important than the style in which that information is presented. Although the latter issue - the reason for the interview - was not perceived as unimportant.

4. The evaluation of the materials and methods by the planners and engineers.

Amongst the planners interviewed, the USDA approach to data presentation was preferred, and the pedotechnical setting document was mildly unacceptable. However, most planners admitted they seldom use the actual data and are more apt to use the interpretations instead. The interpretive approach of either system was generally well received and no clear preference emerged. Either system was desired and would be used.

Although most planners were familiar with the USDA approach, many preferred pedotechnique approach to providing interpretations because a factor-by-factor assessment is made and no overall interpretation is given. Other planners preferred an overall interpretation so that a quick evaluation could be made by them.

Amongst the engineers interviewed, a slight preference for the USDA data presentation tables was expressed over the graphic format of pedotechnique. The pedotechnical setting document, however, was mildly acceptable and would be used. Unlike the planners, the engineers were most interested in the data itself, and were uninterested in and would not use the interpretations. In fact, most engineers found interpretations of any form to be unacceptable. Of the two approaches, pedotechnique was better tolerated since no overall interpretation is provided.

Most engineers were concerned that interpretations would be misconstrued as recommendations and incorrectly used for making on-site decisions. Because the interpretations can be misused, and since evaluation of sites requires more information than that which a soil survey can provide, they feel that surveyors should not be making interpretations. A few engineers perceived the use of interpretations for broad planning purposes which could advert future site problems or direct engineers to areas requiring more detailed investigation - these engineers found interpretations mildly acceptable.

5. Other important observations.

(a) For planners, interpretive maps preferred over interpretive tables since assessments can be more quickly made. Planners have little time to spend on soils data, so must get the information out easily and rapidly.

Engineer's Reactions to USDA and Pedotechnique *

Agency (no. of Engineers)	Data Presentation		Interpretation	
	USDA	Pedotechnique	USDA	Pedotechnique
Ministry of Highways (4)	4	3	1	2
Consultants (3)	3	4	3	3
Ministry of Forests (2)	4	3	1	2

Planner's Reactions to USDA and Pedotechnique *

Agency (no. of Planners)	Data Presentation		Interpretation	
	USDA	Pedotechnique	USDA	Pedotechnique
Ministry of Lands, Parks and Housing (6)	4	2	4	3
Ministry of Municipal Affairs (2)	4	2	3	4
Regional District (1)	4	5	4	5

1. unacceptable
2. mildly unacceptable
3. mildly acceptable
4. well received
5. enthusiastic reception

* Based on impressions collectively received during the interviews.

(b) Pedotechnical setting document evokes a sense of specificity that is unjustified for most soil survey areas. It gives the impression that information exists for site evaluation when this in fact is not the case.

(c) Cross-sectional diagrams and grain-size distribution curves often considered two good elements in the pedotechnical setting document that should be retained if possible.

(d) Of most use to engineers with respect to soil surveys is just describing each soil's parent materials (i.e. till, glacio-fluvial, lacustrine). The AASHO and Unified classification of soils is also considered very important.

(e) A qualitative description of soil properties is perceived by most engineers as being most useful due to the variability of properties for a given soil type. Quantitative data is collected by engineers for site analysis and hence is generally unnecessary.

(f) For either system, it is important that the soil surveyor make clear as to what kind of information is being presented for each soil type - modal descriptions, average characteristics, or ranges of characteristics. The latter is concerned by most engineers to be most honest, less misleading, and thus of most use.

(g) In pedotechnique, the use of symbols is somewhat confusing for uses such as resource materials versus septic tanks. For example, a dash (-) means unsuitable for materials or no problems for septic tanks. It's a desirable condition in one instance, and undesirable in another. Similarly, in the USDA system, some confusion arises between "suitability" versus "limitation" ratings.

(h) General concern expressed over the possible misuse of interpretations. For example, on-site decisions being made on basis of interpretive map. Most planners and engineers understood limitations due to scale, however, were concerned other people might not. In this regard, it was urged that we clearly express the limitations of interpretive data to problems of reliability, accuracy and scale.

(i) For planners, interpretations which are commonly desired are sources of sand and gravel, septic tank absorption fields and dwellings. Identification of hazards is considered extremely important.

6. Summary recommendations.

(a) Use a tabular format for presenting soil engineering data similar to the USDA procedure. Show qualitatively the range of characteristics commonly encountered for each soil. Elsewhere in the soil report, show a cross-sectional diagram and grain-size curves.

(b) Although engineers do not want interpretations, the primary users of soil maps are planners and they are interested in soil evaluations for non-site specific planning purposes.

(c) The pedotechnique approach to preparing and presenting interpretations is preferred i) due to lack of ambiguity; ii) because each factor is rated separately; and iii) because no overall rating is provided. For iii) above, the risk of providing an overall rating which can either be misused or negatively received by engineers appears to be greater than the advantage of being simple and concise to planners.

(d) Two views exist regarding whether to permit an overall interpretation of "slight," "moderate," or "severe," or "good," "fair," or "poor." One view is that overall ratings should not be used by soil surveyors since they are either redundant once each soil factor is evaluated, or inconsistently applied, and that they can be misconstrued as land use recommendation. The other view is that flexibility should exist so that the surveyor has at least the option of providing an overall interpretation if the client wants it.

(e) A possible alternative format for presenting soil limitations on interpretive maps and tables is shown on the following table. This has not been tested and is only a suggestion for consideration.

Soil Limitations for Septic Tanks

Nature of Problem	Degree of Problem		
	unlikely	Possible	likely
permeability		p	P
hydraulic conductivity		k	K
water table		w	W
flooding/inundation		f	F
slope (topography)		t	T
stoniness		s	S
depth to bedrock		r	R
sand equivalent		q	Q
no problems	0		

For interpretive maps, a simple map unit could read:

RS or wp or Rt

whereas a composite or complex map unit could read:

$FWt^6 - 0^4$ or $R^7 - fp^3$

Ontario Evaluation

B. van den Broek and E.W. Presant

1. Understanding the Material

A. Pedotechnique

- Pedotechnical setting document -- no problems with the first 3 modules. Module 4 presented some problems in understanding some of the graphs and how to input certain information.

- Pedotechnical interpretation sheets -- modules 1, 2, 3 and 5 relatively easy to understand. Problems with certain parts of module 4 to understand the graphs, also lack of data to make adequate interpretations.

- The same format should be followed for all interpretations, if possible, to avoid confusion e.g. resource materials interpretation has "resource class" instead of "problem class" and unlikely (-) as the best class. In the other interpretations, unlikely (-) is the worst class. Recreations sheet must be accompanied by suitability guides and class limits.

B. USDA

- No particular difficulty in following guidelines of USDA "Guide for Interpreting Engineering Uses of Soils". Biggest problem was lack of hard data -- in these cases estimations were made. Also, some problems where guidelines for interpretations requested were not in the USDA Guide. In this case, other sources such as 1973 C.S.S.S. proceedings were used.

2. Time for Completion

Difficult to evaluate because of the way we proceeded. In the initial stages, we had a student compiling information and doing as many as possible of diagrams, tables, etc. This was because the data was scattered around, and we had to be involved in a busy field program which greatly restricted the time we could spend on this project.

On the basis of the time spent by the student and later by us in completing the assignment, we would have to conclude that it took longer to compile and interpret material for Pedotechnique than for USDA.

3. Presentation of Materials

The material was presented to a local consulting group composed of pedologists and engineers who have been involved in a wide range of soil studies ranging from very site-specific to generalized environmental assessments. Unfortunately, both engineers were away during the time that they had the material for evaluation, so most of our reaction is from a pedologist, Erv Mackintosh, who has worked extensively with engineers and is familiar with the kind of information they require for many soils projects. Obviously, Erv's level of comprehension and interest in this material was high, and it was relatively easy to present to him.

4. Evaluation of the Materials

A. Pedotechnique

- rated high (4-5) for usefulness of information
- rated moderate to low (3-1) for ease of understanding

Comments
Likes the overall format; suggests that it should be quite understandable to most engineers because it follows some standard engineering formats. He thinks that the information would be more useful to engineers than USDA material and could act as a bridge between the pedologic and engineering views of soils.
He suggests changes in some of module 4 graphs for easier comprehension, particularly on pages 27, 28 and 29. Also, problems with module 4 of some interpretation diagrams, especially page 55. Expects planners and other non-engineers would have trouble following the system.

B. USDA

- rated medium to low (3-1) for usefulness
- rated medium to low (3-1) for ease of understanding

Comments
Doesn't care for the slight, moderate, severe approach -- only highlights problems and doesn't provide solutions. Suggests too many interpretations are for site-specific uses which will require on-site investigations regardless.
Probable that USDA interpretations can be made faster and require less space in soils reports than Pedotechnique.

5. Other Important Observations

i) Recreation interpretations are of limited use, mainly because of their site-specific nature, and because other non-soil factors are usually much more critical in choosing their locations. Suggests consideration of inclusion of design solutions to overcome limitations.

ii) Suggestion that certain "quality data, if provided for each soil, could be very useful for consultants and engineers who want to make their own interpretations, but need good data. Such properties as erodibility, drainability, plasticity index, etc. could be very useful. It should be fairly easy to determine which of these properties are most useful for non-agronomic <u>and</u> agronomic interpretations.

iii) The pedotechnical layer concept needs further discussion. The problem is that almost all information is provided for PT1, and we know little about the underlying materials.

6. Conclusions and Recommendations

A. Main Conclusions

i) Pedotechnique probably presents information in a more informative and useful way to engineers than does USDA.

ii) Ease of understanding of both Pedotechnique and USDA systems is not too good. Engineers would probably have more trouble with USDA; non-engineers, especially planners and people with no soils or engineering backgrounds, would likely have trouble understanding Pedotechnique.

iii) Good analytical soils data and "quality" interpretations such as erodibility and drainability are often more useful to users than site-specific interpretations.

iv) Recreation interpretations have limited use because of their site-specific nature, and the importance of other non-soil factors in determining where they will be sited.

B. Recommendations

i) More time to evaluate the two systems. Attempt to have potential users actually use the information for specific projects. More feedback from users regarding kind of data, format, etc. most useful to them in making engineering or recreation decisions.

ii) To continue with the development of Pedotechnique, attempting to improve consistency and comprehensibility of areas that are causing problems.

iii) The option of using USDA and/or Pedotechnique systems or other ways of making non-agronomic interpretations should not be mandatory and would depend on the location, expected users, etc.

iv) Serious consideration should be given to inclusion of as many "quality" parameters, such as erodibility, in reports as possible. These could be useful to a wide range of users, and could complement, perhaps even replace, non-agronomic interpretations.

v) Re-evaluate the usefulness of interpretations for most recreation purposes. Recreation uses are so site-specific and governed by non-soil factors, that general interpretations have only limited value.

Summary Report and Recommendations

D.F. Acton and W.W. Pettapiece

The charge given Pettapiece and Acton reads as follows: "The final report must contain recommendations respecting:

a) The preferred method or approach to making and presenting nonagronomic interpretations in soil reports and other vehicles. Reference should be made to:

   i) Pedotechnique approach developed by Gil Wilson in the Pedotechnical Interpretation System for Soil Surveys in Canada. June, 1980.

   ii) USDA Guide to engineering interpretations.

   iii) Other, including some hybrid, drawing upon elements of i) and ii) above. Be specific on what elements would be chosen.

b) The ultimate "System" to be adopted as preferred by ECSS."

Before we turn to this charge we should acknowledge the excellent work of P.M. Daykin, T. Vold and D. Moon for their comparison of two alternative methods for interpreting engineering uses of soils in British Columbia, and W. Michalyna and T. Presant for similar analyses and Ontario, respectively. Their reports are presented in other parts of these proceedings.

There is one observation we feel should be made with regard to nonagronomic interpretations as part of soil survey programs. It relates to our concern that some people feel a similar set of interpretations should be a part of all soil survey programs. It is our contention that this should not be the case. In some areas there may be no identifiable user of nonagronomic interpretations. Under these conditions it may be appropriate to completely ignore this work component or at best present a minimal, basic package. In other instances the survey may be conducted at the request of planners or some similar group where they have very specific demands for data and interpretations. It follows then that any manual developed for the purpose of assisting those responsible for making these interpretations as well as project managers, drawing the specifications for soil survey projects, must realize the variable needs. It does not follow that a good manual or system or set of guidelines needs to be comprehensively and universally applied nor that a system that is not comprehensively and universally applied is not a good system.

RECOMMENDATIONS

There can be no doubt that there is a need to make our information available in forms acceptable for engineering uses. There are users who could and would use the information for specific purposes or in specific areas.

Based on what we read and heard we recommend that Soil Survey Reports recognize two user groups in the realm of engineering interpretations, engineers and planners. It appears that engineers are prepared to accept data but are not interested in value judgements by other people. Planners on the other hand, particularly at a general level, want interpretations. In some cases they may prefer individual factor analyses but these appear to us to be special cases which should be identified at the time of project initiation.

The section for engineers should consist of mainly a tabular listing of soil features or properties - preferably giving the expected range in values where applicable. Specific features should include geologic material, slope, drainage, grain size distribution, Atterberg limits and an engineering classification. Pedotechnique embodies the principles required by engineers and could be applied to this section.

The section for planners should make value judgements about the suitability or limitation of soils for particular activities. These activities could include a wide variety of uses ranging from such things as septic tank filter fields to recreational aspects such as hiking trails to sources of gravel or topsoil. The exact ones should be chosen to fit the objectives of the survey. The USDA evaluations would appear to be best suited for general planning functions.

We see a good deal of merit in the pedotechnique development. There are some excellent concepts and approaches. We think they should get wide exposure and to this end recommend that Gil Wilson take the comments and criticism received via the trial processes, that he revise his text in light of those comments and that Agriculture Canada publish it as a report or bulletin. Our feeling is that if this report was made available to the scientific community at large it could receive more thorough trial and review. Soil surveyors, or anyone else, could use portions of it as they see fit. We would further suggest that those involved in the testing act as a review board for the report.

SOIL CLASSIFICATION

Charles Tarnocai

INTRODUCTION

Problems relating to soil classification were identified and assigned priorities by the Soil Classification Subcommittee in 1979 (Tarnocai 1980). Although these recommendations formed the basis for the activities of this subcommittee, additional problems relating to soil classification were added in 1980. Thus, our group began to work on some of those problems identified in 1979 and, in addition, on some new problems which came up during 1980.

ACTIVITIES IN THE 1980'S

1. Organic Horizons, Folisols, and Humus Form Classification.

The first progress report of the Working Group on Organic Horizons, Folisols and Humus Form Classification (Trowbridge 1980) was submitted last year and was reviewed by this subcommittee. Based on the comments received, the Working Group prepared their second report (Organic Horizons, Folisols, and Humus Form Classification Working Group 1981). This 85-page report contains four sections: (1) introduction and general recommendations, prepared by Rick Trowbridge; (2) definitions of organic horizons by Dave Moon; (3) classification of Folisolic soils by Herb Luttmerding; and (4) humus form classification by Bob Green and Rick Trowbridge. A brief description of these sections with recommendations and the overall, general recommendations prepared by the chairman are as follows:

Definition of Organic Horizons

It was indicated in this report that, before proposing changes to the existing system, much more supporting data must be collected for representative organic horizons. The authors express concern over the use of terms such as "freely drained" and "poorly drained". They conclude that any changes should be deferred until more data are available and there has been time for critical evaluation at the national level.

Classification of Folisolic Soils

This report is a revised edition of the 1980 report (Trowbridge 1980) and consists of background information concerning the concept of Folisolic soils in which emphasis had in the past been placed on the underlying mineral soil or bedrock. The author of this report feels that, in the case of Folisols, the accumulation and decomposition of organic forest floor material should be considered as a dominant soil-forming process. The original three options for classification of Folisols presented in the first progress report (Trowbridge 1980) have now been reduced to two and are as follows:

a) Expand the current Folisol great group of the Organic order to include soils with thick L, F and H horizons over unconsolidated mineral soil.
b) Delete the Folisol great group from the present Organic order to form a Folisolic order, leaving an Organic order consisting only of poorly and very poorly drained soils.

The report contains ten Folisol profile descriptions with chemical and physical analyses and a figure showing the average depth of L, F and H horizons in British Columbia.

The author concludes that some basic decisions on the classification are required at the national level and the work should be continued by the Soil Classification Subcommittee of ECSS.

Humus Form Classification

This report has gone through numerous drafts since its inception a few years ago so as to meet the needs of ecologists and pedologists working in the forest ecosystems of British Columbia. It will be published in May of 1981 by the B.C. Ministry of Forests as a first approximation for field trial. It will be presented through the Soil Classification Subcommittee to the ECSS as a national discussion paper.

Recommendations Presented in the Introduction by the Chairman

The members of the B.C. Working Group feel that they have completed their initial objectives and now suggest that the Soil Classification Subcommittee take responsibility for the proposed classification change. This suggestion is based on the following:

1) The data formulating the proposals are regional, not national.
2) Formal national data collection and analyses should be undertaken by a national group.
3) Proposed changes in classification must be tested throughout Canada, not only in British Columbia.
4) The work involved in data collection, analyses, and testing of proposals in beyond the responsibilities and capabilities of the B.C. Group.

In the concluding paragraphs of this report the chairman points out that soil organic horizons, which are found in forests throughout Canada, are probably the most critical soil component of the forest ecosystem in terms of soil development, nutrient cycling, regeneration, soil climate, and protection from erosion. The ECSS, through the Soil Classification Subcommittee, must consider, as a very high priority, addressing the inadequacies of our present classification system, descriptive methodology, sampling methods and analyses as regards forest organic horizons.

2. Meeting with Dr. Guy Smith.

Meetings were held in several American locations during which conversations were carried out with Dr. Guy Smith relating to the philosophy and rationale of the U.S. Soil Taxonomy, diagnostic criteria, class definitions and other related questions. The purpose of these conversations was to explain the reasons behind the parameters used and the criteria and philosophy applied in the U.S. Soil Taxonomy.

In May of last year Richard Guthrie, acting director of the U.S. International Soil Program, asked me to attend one of these meetings and prepare questions relating to the classification of permafrost soils as it is handled by the U.S. Soil Taxonomy. Thus, most of my input during this meeting was related to permafrost soils. It did, however, provide me with an opportunity to participate in discussions relating to the other topics mentioned above.

During the discussions relating to permafrost soils, Dr. Guy Smith indicated that, when the U.S. Soil Taxonomy was set up, they had very little information on these soils. He recommended that a small international group of experts (including Canadian expertise) be set up to work out a proposal relating to the classification of these soils. He indicated that he favors the establishment of a twelfth order in the U.S. Soil Taxonomy to handle these soils.

All discussions during these meetings were tape recorded and will be published by the U.S. International Soils Program Section.

3. Research Activities Relating to Gleysolic Soils.

Comments were received from almost all regions of Canada concerning the need to review the classification of Gleysols. Since this is such a widespread problem, the Soil Classification Subcommittee decided that the problems relating to the classification of Gleysols should be a high priority item in future work on soil classification.

This year the Soil Classification Section of the Land Resource Research Institute initiated a research project on Gleysolic Soils. This study, to be carried out by Alex McKeague and Chang Wang, will concentrate on poorly and imperfectly drained soils at a selected number of locations across Canada. It will focus on studying the properties of mottles and other soil properties characteristic of Gleysols and Gleysolic soils using all applicable methods (micropedology, soil chemistry, etc.).

4. Contrasting Horizons and Layers.

It has been pointed out that the contrasting horizons or layers, indicated by Roman numerals in pedon descriptions, are interpreted in various ways by pedologists. The Soil Classification Subcommittee was asked to look into this problem. The responses to a questionnaire related to this problem revealed that the majority of the people found the existing definition (Canada Soil Survey Committee 1978, page 30) only partly satisfactory. The contrasting horizons and layers are interpreted in various ways, but the two extremes of interpretation are: (1) materials having different origins (mode of deposition) and (2) materials having different textural characteristics.

Based on the suggestions received, two alternate proposals were worked out and presented to the subcommittee for discussion.

The definition for contrasting horizons or layers which the Soil Classification Subcommittee accepted and recommended for a two-year testing period is as follows:

Roman numerals are prefixed to the master horizon or layer designation (O, L, F, H, A, B, C, R) to indicate lithologic discontinuities either within or below the solum. The first, or uppermost, material is not numbered, for the Roman numeral I is understood; the second contrasting material is number II, and others encountered are numbered III, IV, and so on, consecutively with depth. Thus, for example, a sequence from the surface downwards might be Ah, Bm1, IIBm2, IICca, IICk1, IIICk2.

Lithological discontinuity is due to the mode of deposition or to strongly contrasting texture (differing by two textural classes) or to differences in the mineralogical composition of the material from which the horizons have formed.

The contrasting materials have resulted from geological rather than from pedogenic processes. A change in the clay content associated with a Bt horizon (textural B) does not indicate a difference in parent material. Appearance of gravel, or a change in the ratios between the various sand separates, will normally suggest a difference in parent materials. A different Roman numeral would not normally be used for a buried soil in a thick aeolian deposit. The difference between the properties of the buried soil and the overlying material are presumably the result of pedogenesis. A stone line, however, usually indicates the need for another Roman numeral. The material above the stone line is presumed to be transported. If the transport was by wind or water, one must suspect that during the movement there was some sorting of the material according to size.

5. Problems Relating to the Classification of Podzols.

A list of problems relating to the classification of Podzolic soils was received from the British Columbia pedology group. A brief summary of these problems, as submitted by Herb Luttmerding, is as follows:

a) One of the perceived problems deals with the distribution of organic matter in soils presently classified as Ferro-Humic Podzols. The present classification specifies that Ferro-Humic Podzols have a Bhf horizon greater than 10 cm thick and containing more than 5% organic carbon. The position of this horizon in the profile, however, is not specified although it seems to be implied that it underlies the Ae. The genetic concept of podzol formation generally consists of complexed organic carbon, iron and aluminum moving downward from the Ae and accumulating in the underlying horizon.

In many B.C. soils, particularily those with root restricting layers (duric horizons, bedrock, compact till), the maximum concentration of organic matter occurs above the restriction and not below the Ae. These soils, usually occurring in the wetter parts of the province, also contain sufficient Fe and Al (pyrophosphate extractable) in the zone of organic matter accumulation to be podzolic by definition (i.e. >0.6% Fe and Al). This zone usually also has a periodic perched water table or is a zone of seepage and generally occurs between 50 and 100 cm below the surface. Substantial evidence of root concentration is usually present and occasionally the zone contains enough organic matter to be classified as an organic horizon. To keep things in perspective, we have soils with 10 cm of Bhf below the Ae and soils with 10 cm of "so-called" Bhf a meter or more below the surface both classified as Ferro-Humic Podzols. Others have Bhf's both below the Ae and at depth. Another typical characteristic of these soils is that pyrophosphate extracted Al values are generally much higher than extractable Fe. This characteristic, however, occurs in more coastal Humo-Ferric Podzols as well. At this time we are not suggesting that the present Podzol classification should be changed. We would, however, like to suggest that research be undertaken to characterize the kind of organic matter occurring at depth and to determine whether it differs from that under the Ae. Is the process that is operating at depth in fact podzolic? When these types of questions are answered and if substantial differences are found, then classification changes can be considered.

b) Another problem deals with (usually) high elevation soils with dark colored surface mineral horizons - those considered to have Sombric Ah's. All of these Ah horizons also meet the criteria for Bhf horizons and have pH values of 4.5 or less, high cation exchange capacities and very low base saturation (may be less than 1%). All of these characteristics appear to make these surfaces more like B horizons than Ah. If an Ae horizon was present at the surface above the Ah, most people would likely accept them as B horizons with little discussion (in fact, some of the Ah's have some characteristics of Ae's - they become gray when dry and contain clean sand grains).

Acid Ah horizons are addressed in the present Canadian classification (Canada Soil Survey Committee 1978, page 95), however the question arises as to whether these horizons are not better designated as B horizons. Further research is required. A tentative classification that could be considered in the future is to define Cryic subgroups for the three Great Groups of Podzols and to classify the horizons as Podzolic B horizons even though they are at the surface.

c) Another problem deals with Bh horizons. We have soils with horizons that meet the chemical requirements of Bh's but do not have the morphology. This commonly occurs with Bf or Bhf horizons where there is little iron but appreciable Al and organic matter. The soils are usually well to imperfectly drained and the Bh horizons usually occur lower in the profile and do not represent the maximum zone of organic matter accumulation. What really occurs is that, if Fe and Al are considered, the horizons are Bf or Bfh while, if Fe and organic carbon are considered, the horizons are Bh. Perhaps all that is needed is more definitive criteria for definition of Bh horizons - i.e. color, mineral horizon of maximum organic matter accumulation, do Bh or Bf (Bhf) horizons take precedence in classification, etc. To date, we really have not come across any soils in B.C which have both the morphology and chemistry of Bh horizons, as specified in the classification system.

6. Definitions for Diagnostic Horizons.

This question was raised by Alex McKeague. The concept of diagnostic horizon is not included in the Canadian Soil Classification although for Chernozemic soils the Chernozemic A is defined as a diagnostic horizon. It would probably simplify the soil classification if diagnostic horizons were defined for all orders since these horizons combine both thickness and chemical or physical attributes of a horizon in a single term. It was agreed that Alex McKeague and myself would formulate definitions of diagnostic horizons for discussion purposes.

As a result of the Subcommittee meeting held on March 3, 1981, the following recommendations relating to the future activities of this subcommittee were presented to the ECSS for acceptance.

1. Begin research work on Gleysolic soils.
2. Carry out the work relating to Folisols, organic horizons and humus forms as follows:
   a) The Soil Classification Subcommittee of ECSS will continue to work on the classification of Folisols on the basis recommended by the B.C. Working Group and will submit a final proposal.
   b) Basic data relating to the organic horizons must be generated to provide a basis for updating the definitions of these horizons.
   c) The humus form classification, which will be published in B.C., should be presented to the Soil Classification Subcommittee for discussion.
3. Formulate definitions for diagnostic horizons for discussion.
4. Review the problems relating to the classification of Podzolic soils as submitted by the B.C. pedology group and formulate solutions to these problems.
5. Begin a two-year test on the definition of contrasting horizons and layers proposed by this Subcommittee.
6. Reactivate the Landform Classification Working Group.

These recommendations were presented to the ECSS on March 4, 1981, and, based on a concensus of the members, they were adopted and this constitutes the resolution of the ECSS for the future activities of the Soil Classification Subcommittee.

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SOIL CLIMATE

G.F. Mills

Introduction

The establishment of the Soil Climate Working Group is in response to a recommendation to the 1980 meeting of the Expert Committee on Soil Survey (ECSS, 1980) Regional input to the Working Group was by correspondence and by participation in a workshop session during the Expert Committee meeting. The main discussion at the workshop concentrated on terms of reference for the Working Group and the development of short and long term objectives and a schedule designed to initiate activities to satisfy those objectives.

Objectives

The overall objective for the Working Group was defined previously in the recommendation to the 1980 ECSS meeting, namely to facilitate the study of -

> "relationships between soil, soil temperature and aerial temperature. The purpose of such study is to better define the role of soil temperature in the System of Soil Classification for Canada and in particular the function it may serve for soil correlation, soil interpretations and land evaluation"

Discussion during the workshop indicated that this broad objective could be achieved more realistically if divided into a short and long term objective.

Short term objective: To encourage and facilitate the systematic monitoring of the soil thermal regime on benchmark soils across Canada.

This entails immediate expansion of present programs and increased communication between soil survey units regarding the storage, retrieval and manipulation of soil temperature data in provincial and/or national data banks.

Long term objective: To maintain a close working relationship with those studying soil moisture regimes and eventually to define the use of Soil Climate in the System of Soil Classification for Canada.

Cooperation with those who are studying soil moisture will insure greater efficiency in monitoring and data collection. As increased amounts of soil temperature and moisture data become available, the Soil Climate Working Group should cooperate with Working Groups on Soil Moisture and Soil Taxonomy to better define the relationship between Soil Climate (both temperature and moisture relations) and Soil Taxonomy.

Rationale

There are serious data gaps in the characterization of soil climate that this Working Group can attempt to fill. The short term emphasis should key on the thermal aspects of soil climate as a program to monitor and characterize soil moisture regime is currently being initiated by a Working Group on Soil Water. There is also continuing study and characterization of aerial climate by other groups. As soil climatic data (both temperature and moisture) become available more precise definition of relationships to aerial climate will be possible.

In the long term, the Soil Climate Working Group must relate to the Working Groups on Soil Taxonomy and Soil Moisture in attempting to define the role of soil climate in the Taxonomy. A close working relationship with the Working Group on Agrometeorology will aid in arriving at viable soil interpretations and land evaluations for various crops. As Dudal (Proc. 2nd International Soil Classif. Workshop, Part I, Malaysia pp. 17-19) suggests, if soil climatic attributes incorporated within the Taxonomy do not offer sufficient specificity or scope to assist in arriving at viable soil ratings for crops (both agriculture and forestry) then "The introduction of soil temperature and moisture phases independent of Soil Taxonomy may have to be given consideration".

Priority

A high priority is assigned to the short term objective of the Working Group because any subsequent progress towards achieving the long term objective is dependent on creating a greatly expanded data base characterizing the soil temperature regime. The long term objective of the Working Group depends on availability of soil climatic data which must be collected over a period of several years. Therefore, the priority assigned to this objective is medium.

Schedule

There is an immediate need to standardize the equipment and techniques for monitoring soil temperature. Current techniques for soil temperature monitoring as applied in Manitoba, Alberta, British Columbia and the Northwest Territories will be brought together and compiled into a recommended method or methods. A "Provisional Methodology" should be distributed in 1981. The "Methodology" should contain the following information:

Site Selection - what constitutes a benchmark site

Instrumentation
- sensors
- method of installation

Monitoring
- frequency
- recommended depths
- precision of readings

Data Handling
- input document
- software for analyzing and processing data
- recommended parameters to be calculated

Delegation of Responsibility

There should be one individual in each survey unit charged with standardizing information, methods and recording techniques and advising on installation of new sites within the province or region. He should in turn communicate with a national chairman in order to maintain national continuity and to facilitate data handling on a national basis.

As the soil temperature data base accumulates, it should be input to a computer based storage system permitting selective retrieval, manipulation and analysis by each soil survey unit having access to a terminal. The handling of provincial data should be the responsibility of the regional representative on the Working Group. Procedures should be established for transfer of this data to a national data bank and at the same time maintain regional use of the data.

Pedologists in Quebec plan to undertake a pilot study to relate soil temperature data to various soil types in the Montreal Plain of the St. Lawrence Lowlands. The correlation of current soil surveys in this area with soils in the United States is hampered by lack of soil climate data. A valuable side benefit from such correlation may be the determination of the advantages and disadvantages of recognizing a Suborder Level in the Canadian Taxonomy as a means of handling soil climate characteristics.

Recommendations

1. The Working Group membership favoured in principle, that current Soil Surveys should include the collection of soil climate data.

   The accumulation of this data is vital. The sooner we get started the better. As with any climatic related variable, monitoring must take place over some minimal time period.

2. Monitoring of the thermal aspects of soil climate should be tied into the soil moisture monitoring program for reasons of efficiency.

   Additional soil temperature sites will be required beyond those initially selected as soil moisture benchmark sites. These sites may be installed on a mapping project basis eventually becoming part of a larger, longer term network.

3. Over the longer term, organizational provision is required for soil climate to be considered more holistically to include tie-in of soil temperature, soil moisture and aerial climate with soil Taxonomy.

4. Under the auspices of the Land Resource Research Institute, The Working Group recommends that selected A.E.S. stations be encouraged to establish and maintain soil temperature monitoring on sites where undisturbed soil conditions representative of large soil areas occur.

Acknowledgement

The chairman of the Soil Climate Working Group is grateful for participation and the interest of soil scientists at the 1981 workshop session and in particular for regional input provided by the following in the preparation of this report: T. Vold and R. Trowbridge (British Columbia), R. Hewitt and R. MacMillan (Alberta), R. St. Arnaud (Saskatchewan), C. Acton (Ontario), R. Baril (Quebec) K. Guthrie (Newfoundland), D. Holmstrum (Nova Scotia), C. Tarnocai (Northwest Territories), H. Hayhoe and J. Nowland (Ottawa).

Soil Interpretation for Forestry

H.H. Krause

The working group on soil interpretation for forestry was reconstituted in 1980. It is structured in such a way that its membership represents most Federal Soil Survey Units throughout the country, provincial soil survey units with a strong interest in forestry, and provincial governments and industries as potential users of soil survey information. In addition, the Committee includes forest soils specialists from universities and the Canadian Forestry Service.

The Working Group was given a provisional mandate by the Experts Committee on Soil Survey (ECSS). After minor changes to the ECSS statement, the Working Group proposes reaching of the following objectives as its final mandate.

1. To develop guidelines for the interpretation of soil information for forestry from surveys at various levels of intensity, and to publish them at the earliest feasible time,

2. to develop improved methods and criteria for conducting surveys and for evaluation of forest lands at various levels of intensity,

3. to determine the need for research projects in support of improved soil-forestry interpretations and promote their undertaking by qualified scientists.

Development of guidelines as stated under 1. will be given priority in work during 1981/82.

Soil Water Regime Classification 1981

J.L. Nowland

Introduction

This is the third progress report of SWIG and the reader is referred to the 1979 and 1980 Reports for background information. It will be recalled that the Group exists primarily to develop a new method of characterizing the soil water regime, and to examine research needs. It is time now to conclude the first task by recommending adoption of an alternative method for a trial period. Faced with a profound lack of data, we have reached a point where few benefits can come from further re-shuffling classification parameters and class limits, while more might be achieved from concentration on the collection of basic data.

The proposed scheme is intended to replace the existing ones, but the traditional soil drainage classes can be retained if desired. Testing has been very limited, but in the course of correlation tours in the Eastern Provinces, and an all-too-rapid three-week trip to points West, the Chairman receives some appreciation of what is needed in a simple national scheme. Refinement will have to come with time and data, in other words, "we've gone about as far as we can go".

Arising from the 1980 field tours

As background to the latest revision, a few issues from the 1980 field season can be mentioned, without going into details of lessons learned from Gene Heatherington's impressive installations on gushing 50% slopes on Vancouver Island; from the drive for consensus on landscape relationships led by Bob Eilers around pits on the Prairies; the truths about tree-sustaining pore water vapor laid bare by Garry Bank's prodigious digging in bouldery fans at McBride (Newfies look out...!), and scores of other discussions. The well-organized tours in British Columbia, Manitoba and Saskatchewan were specifically with SWIG in mind. I cannot recall another tour wherein the choice of sites were so consistently relevant to the problems on hand; my appreciation goes out to Dave Moon, Bob Eilers, and all involved.

1. SWIG 1980, with a few more revisions, seemed to be a viable basis for a simple national scheme, as long as it provides for locally important subdivisions, aggregation and grafting of individual class separations.

2. Predictably, and almost without exception, everywhere hard data are available, e.g. Southwest Manitoba, Carnation Creek (Vancouver Island), Fraser Delta, Ottawa-Carleton, they have revealed enough hidden complexity to signal extreme caution in making estimates and oversimplifying the behaviour of soil water.

3. SWIG 1980 was discussed on regular correlation tours all through the Eastern Provinces, and seemed to be quite acceptable, if no more precise, than traditional methods. Modifications amounted to fine-tuning.

4. In Ontario the general conclusion was to use the SWIG system in the description of detailed sampling sites initially, making it optional at daily field sheet observations.

5. Great difficulty in estimating K sat on volcanic material on Vancouver Island was a theme repeated everywhere, from the tills of eastern Saskatchewan to the structured clays of the St. Lawrence Lowlands.

6. Interpretation of mottles was always good for a laugh anywhere. Problems included whether the mottles were derived from parent material colours, which is matrix and which is mottle, etc, etc, and these issues appear to universal.

7. The concept of Aridity Index was endorsed by a climatologist (R. Davis) for British Columbia soils, and it seemed to work well in Manitoba. It was clearly less meaningful where a groundwater table was present within 3 m of the surface.

8. Suggestions for a hierarchical scheme made sense, with relatively coarse classes for crude estimates, divisible into finer classes where better data are available; it also provides for greater emphasis on certain parameters that are locally important.

9. There were a few convincing arguments for long term detailed monitoring sites in preference to many scattered dipwells.

10. It became clear that sharply contrasting fine textures over coarser textures must be characterized as an impeding layer to water movement in a system that is not fully saturated.

11. The depth of friable soil over duric layers and other dense subsoils is a critical element in characterizing water regimes; depths to such layers should be measured from the organic surface, to allow for thick organic surfaces. Frozen soil is an important impeding layer in many soils in spring but it is difficult to know how to handle it.

12. Deeper saturated zone classes were clearly required, which meant changing the classification approach slightly. The rapidity of the response of water tables to precipitation on the Fraser Delta was a really surprising finding of Driehuyzen's measurements. The duration of the saturated zone at levels other than the arbitrary 50 cm was also felt to be important.

13. There was a surprising amount of support for the USDA water states table.

14. It was pointed out that the proposal has limitations for characterizing the leaching potential at different slope positions on undulating and rolling land in the Dark Brown and Black soil zones.

The above is no more than a sampling of points arising out of far ranging discussions in many places through the summer. It is not possible to mention here the scores of useful suggestions and interesting observations, such as double perched water tables and strange seepage phenomena.

The revised system

The revised system is appended.

It will be noted that it omits any reference to climatic stratification which hopefully will be appended at some future date. Other items to be omitted, and left to local units to adopt as necessary are classification of runoff and concepts of site drainage e.g. shedding and receiving sites, and classification of surface ponding. Refinement of seepage criteria is a local option.

Recommendation 1

SWIG recommends testing of the proposed classification of soil water regime for a trial period of five years, subject to re-evaluation at that time.

Data Collection

The need for an effort in basic data collection has been obvious from the beginning, and the seriousness of the deficiency becomes more apparent with time.

Initially, some of us thought that much would be gained from relatively simple dipwell installations in areas currently being surveyed. That may still be true. Experience to date is that scattered shallow dipwells are useful in order to relate the water table to gleying features in a profile, to gain a rough idea of the response to precipitation events, and to prove the existence of perched water conditions in certain soils. However, it is the general opinion of SWIG that more solid progress in filling the data gap would be achieved by establishment of a number of more comprehensive data collection sites, the rationale being that "if it is worth doing at all, it's worth doing well". Suggested specifications for these Soil Water Benchmark Sites (SWABS) are as follows:

1. They should be designed to cover 2 or 3 distinct landscape facets, such as a toposequence of soils, in other words a cluster of 2 or more subsites, over a period of 3 to 5 years.

2. Three replicates of some measurements at each subsite to validate conclusions if one installation becomes suspect.

3. Unless the site is very close to an AES station, continuous precipitation measurement is essential to the utility of water table traces.

4. Water table. Observation wells duplicated at each subsite, 2.5 to 5 cm in diameter, 3 m deep, additional duplicate wells to isolate perched water effects as necessary. The diameter should accommodate a neutron probe if necessary.

5. Groundwater flow patterns. Piezometers in duplicate to 5 m depth, strategically located at the site to provide sufficient measures of hydraulic head to trace out significant groundwater flow patterns.

6. Moisture content. Time Domain Reflectometry (TDR) method or neutron probe, plus augered gravimetric samples.

7. Transmissibility. Saturated vertical hydraulic conductivity determined at subsites as close as possible to the location of instruments, but not to risk disturbance effects on them. The Air Entry Permeameter is the recommended method, but on uncooperative soils the auger-hole methods applicable either above or below the water table should be used. Determination of hydraulic conductivity on 7.5 cm cores is regarded as a last resort, but preferable to determination on 5 cm cores. Cores should have 5 replicates, with 3 as an absolute minimun.

8. Detailed morphological descriptions. These are required for the soils at each subsite, paying special attention to structure, porosity and gleying phenomena.

9. Soil temperature. It would be convenient to monitor soil temperature with thermistors installed at the subsite in order to fill another major data gap.

10. Laboratory Analyses. The routine analyses pertaining to item 8 above, but including desorption curves, and moisture content at greatest suctions to supplement the field measurements.

Most soil survey units lack the resources to mount this kind of data collection effort at more than 2 or 3 sites. Two or 3 sites however would be a useful start. Cooperation and integration of effort with universities, AES and other agencies is clearly indicated, and soil survey needs should be made known to attract those contemplating research in this subject.

The methods to be used for the measurements described above should be compiled in a Soil Water Investigations Methods Manual (SWIMM). SWIG proposes to commence this task immediately with a target date for review next winter and completion in March 1982. This schedule may be contingent upon the extent of any further reworking of the water regime classification. SWIG's SWIMM will enhance the comparability of the SWABS.

Recommendation 2

SWIG recommends compilation of a Soil Water Investigations Methods Manual, to guide the collection of data needed in the characterization of water regimes by soil survey. SWIG would assume the editorial role.

Future work of SWIG - miscellaneous recommendations

1. Top priority should be given to integrating Cryosolic soils into the soil water classification scheme.

2. Top priority should also be given to exploring ways and means of integrating soil survey effort with that of other agencies to expand the SWABS network.

3. SWIG should investigate the need for introducing climatic parameters into the classification system for soil water regimes.

4. The operation of the proposed classification scheme if adopted, should be monitored by soil survey units and correlators, with a view to circulating periodically a summary review.

REFERENCES

Shields, J.A. and Sly, W.R. 1981. Aridity Indices derived from soil and climatic parameters. I. Perennial Crops 13 pp. (in press).

Stout, M. (ch). 1979. Soil Water Relations, Rept. of Committee 6, National Work Planning Conference of the Co-operative Soil Survey, San Antonio, 1979.

CLASSIFICATION OF SOIL WATER REGIME (SWIG 1981)

This classification scheme is applicable to soils without a perennially frozen horizon. The basic classification rests upon four parameters; Aridity, Soil Transmissibility, Zone of Saturation (water table) and Man-made Modifiers. Two additional optional parameters are inserted: Seepage and Duration of Zone of Saturation. A year-round water-state matrix is appended as an optional descriptive component.

ARIDITY (A) CLASSES

Class	Aridity Index	Class	Aridity Index	Class	Aridity Index
1	<100 mm	5	250-299	9	450-499
2	100-149	6	300-349	10	500-549
3	150-199	7	350-399	11	550-600
4	200-249	8	400-449	12	>600

Aridity Index: the long term average of the supplemental water required to maintain plant available water equal to or greater than one-half of capacity throughout the growing season for a perennial crop. (Shields and Sly 1981).

Aridity Classes are applicable to soils in Semiarid and drier soil climates (water deficits >12.7 cm), lacking moisture supply from a zone of saturation within 2 m of the surface in the growing season (or 3m in loamy particle size and finer).

SOIL TRANSMISSIBILITY (K) CLASSES

Classes			Vertical saturated hydraulic conductivity m/s	Vertical saturated hydraulic conductivity cm/h
H	HIGH	H1 very rapid	$>1.39 \times 10^{-4}$	>50
		H2 rapid	$<1.39 \times 10^{-4}$	50-16.7
M	MEDIUM	M1 moderately rapid	$<4.63 \times 10^{-5}$	16.7-4.2
		M2 moderate	$<1.16 \times 10^{-5}$	4.2-1.7
		M3 moderately slow	$<4.63 \times 10^{-6}$	1.7-0.42
L	LOW	L1 slow	$<1.16 \times 10^{-6}$	0.42-0.17
		L2 very slow	$<4.63 \times 10^{-7}$	0.17-0.017
		L3 extremely slow	$<4.63 \times 10^{-8}$	<0.017

The K class is determined by the layer of lowest vertical saturated hydraulic conductivity within 2 m, including organic horizons. The classes are those used by SCS-USDA for horizon characterization. They provide an option in degree of precision between 3 or 8 classes.

SOIL TRANSMISSIBILITY (K) SUBCLASSES

These are used to denote the Kind and Depth of a significant impeding soil layer or pore space discontinuity between 20 and 200 cm, upon which a Medium or Low K classification is based.

Subclass A. Downward REDUCTION in macropore space resulting in significant reduction of K sat, <30% of K sat of the overlying layer, or sufficient to cause significant perched saturation.

Subclass B. Downward INCREASE in macropore space sufficient to restrict water movement significantly, e.g. loam over gravel.

A1 and B1	Very shallow, 20 - 50 cm
A2 and B2	Shallow, 50 - 100 cm
A3 and B3	Moderately deep, 100 - 150 cm
A4 and B4	Deep, 150 - 200 cm

SATURATED ZONE(S) CLASSES (water table)

The estimated average annual least and greatest depths to soil that is saturated for two consecutive days or longer determine the S class. There is a choice of 3 coarse or 7 finer classes, and the table is entered twice - first for the least and second for the greatest depth.

CLASSES		Depth(cm)
H HIGH	H1 Very high	0 - 50
	H2 Moderately high	50 - 100
M MEDIUM	M1 Medium to high	100 - 150
	M2 Generally low	> 150
	M3 Medium to low	150 - 200
L LOW	L1 Moderately low	200 - 300
	L2 Very low	> 300

The "generally low" (M2) class is inserted to cover situations in which no estimates beyond 150 cm depth are being attempted. A perched zone of saturation is classified no differently from continuous groundwater, since this situation is identified elsewhere in the classification; but the perched zone must be 10 cm thick or greater to warrant recognition.

SATURATED ZONE - DURATION(D) SUBCLASSES (OPTIONAL)

These are used only where there is a need to discriminate between soils in the same Saturated Zone (S) class. This is done on the basis of duration of saturation within the depth limits of the least depth class, i.e. highest water table.

SUBCLASS	DURATION (days)
S SHORT	2 - 20
M MEDIUM	21 - 60
P PROLONGED	> 60

The need for duration subclasses commonly arises for soils with "perched water tables" because the condition may be either ephemeral or long lasting. It may be necessary in some areas to record whether the duration of "high water table" is more or less continuous or consists of the sum of many fluctuating peaks; in this case the addition of an "ephemeral' modifier is left to local discretion and definition, but with the possibility of incorporating it in the system at a later date.

OPTIONAL SEEPAGE SUBCLASSES

These subclasses are used to denote major seepage that has significant impact on biological response or soil performance.

SUBCLASS		CRITERIA
E	Enriching seepage	raises plant productivity
N	Neutral seepage	little significant effect on plant productivity, or effect indeterminate
D	Deleterious seepage	depresses plant productivity e.g. saline seeps

"Major seepage" is that occurring in soils saturated at some depth within 2 m for several weeks during the year and several days after precipitation. If its depth is not already indicated by K subclasses A1 to A4, the same depth classes 1 to 4 can be noted here.

MAN-MADE MODIFIERS

These are used to indicate two degrees of impact, minor and major, of long-term modification of soil water regime.

D, DD	ditched (open, covered)	R, RR	ridged, listed, plancheron
T, TT	tube drained (tile, plastic)	I, II	irrigated
M, MM	mole drained (unlined)	X, XX	water table raised by dams, drainage scheme discharges etc.
S, SS	subsoiled		

This is adopted from the USDA-SCS "Annual Water-State Regime" (Stout 1979) with slight modifications. It is a continuous record or estimate of water state at four depths, as illustrated by the following hypothetical example. It can be constructed gradually over the life of a survey project, or refer to one soil in one year.

Depth (cm)	J	F	M	A	M	J	J	A	S	O	N	D
0-25	fr	fr	vm	vm	sm	sm	dr	dr	dr	sm	sm	fr
25-50	fr	fr	fr	we	vm	vm	sm	dr	dr	dr	sm	we
50-100	we	we	we	we	vm	vm	sm	dr	dr	dr	sm	vm
100-150	we	we	we	we	we	vm	vm	sm	dr	dr	dr	sm

Water-states prevailing for over half of the month:

we: wet - visible water films on soil particles and peds
vm: very moist - no visible water films, no colour change on wetting
sm: slightly moist - colour changes on wetting
dr: dry
fr: frozen

Water-states are estimated, except where the symbol is <u>underlined</u> to indicate a direct observation. "Boundaries" can be inserted and the zones shaded or coloured.

Indicate in a footnote:

1. Whether the matrix is site-specific or averaged for a number of sites, for a soil or for a map unit.

2. Whether the matrix is for one year or an average of more than one.

3. The vegetation at the site, if applicable.

SOIL WATER REGIME CLASSIFICATION

SOIL DRAINAGE 1

VR	very rapid	( )
R	rapid	( )
W	well	( )
MW	moderately well	( )
I	imperfect	( )
P	poor	( )
VP	very poor	( )

ARIDITY (mm) 2

1	<100 mm	( )
2	100-149	( )
3	150-199	( )
4	200-249	( )
5	250-299	( )
6	300-349	( )
7	350-399	( )
8	400-449	( )
9	450-499	( )
10	500-549	( )
11	550-600	( )
12	>600 mm	( )

TRANSMISSIBILITY (cm/h) 3

H	HIGH	>16.7	( )
H1	very rapid	>50	( )
H2	rapid	16.7-50	( )
M	MEDIUM	.42-16.7	( )
M1	mod-rapid	4.2-16.7	( )
M2	moderate	1.7-4.2	( )
M3	mod-slow	.42-1.7	( )
L	LOW	<.42	( )
L1	slow	.17-.42	( )
L2	very slow	.017-.17	( )
L3	extr. slow	<.017	( )

IMPEDING LAYERS (cm) 4
(reduced porosity)

A1	20-50 cm	( )
A2	50-100 cm	( )
A3	100-150 cm	( )
A4	150-200 cm	( )

(increased porosity) 5

B1	20-50 cm	( )
B2	50-100 cm	( )
B3	100-150 cm	( )
B4	150-200 cm	( )

SATURATED ZONE

Average annual least depth (-) 6
and greatest depth (v). 7

H	HIGH	<100	( )
H1	very high	0-50	( )
H2	moderately high	50-100	( )
M	MEDIUM	100-200	( )
M1	medium high	100-150	( )
M2	generally low	>150	( )
M3	medium-low	150-200	( )
L	LOW	>200	( )
L1	moderately low	200-300	( )
L2	very low	>300	( )

Duration-least depth (days within class limits) 8

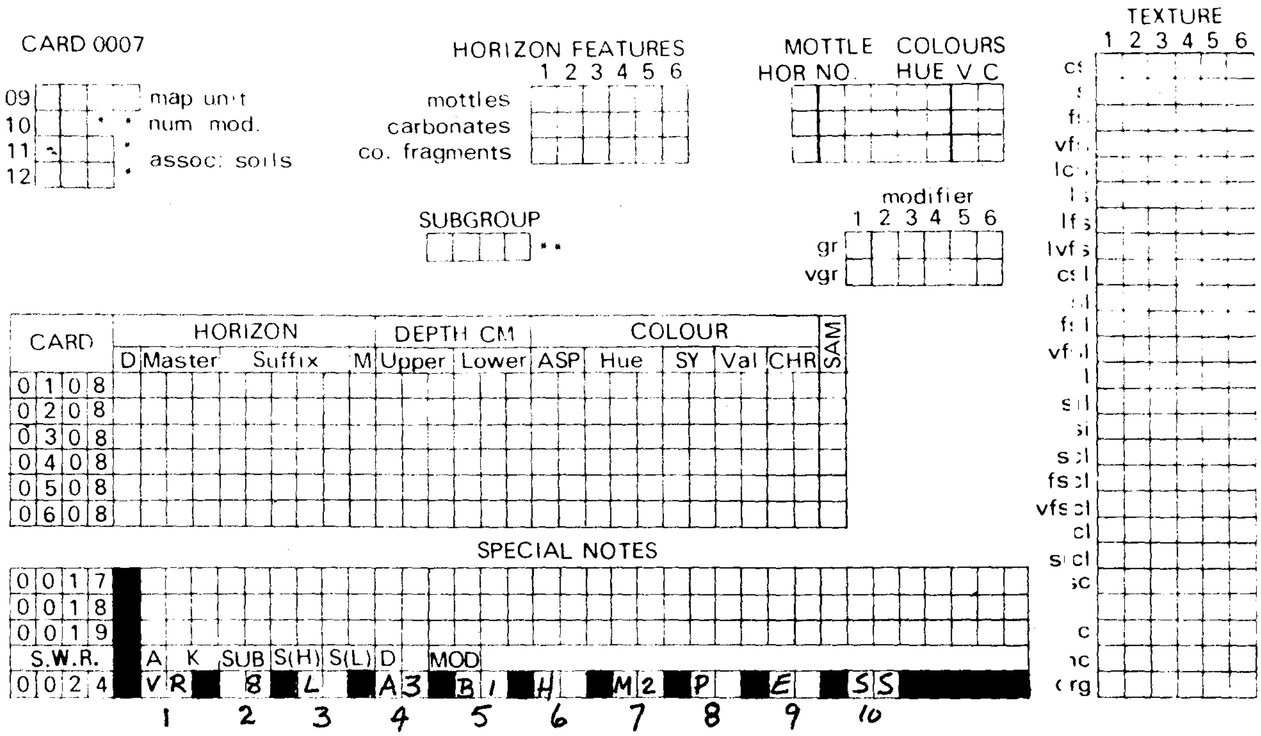
S	short	2-20	( )
M	medium	21-60	( )
P	prolonged	>60	( )

SEEPAGE 9

E	enriching	( )
N	neutral	( )
D	deleterious	( )

MAN-MADE MODIFIERS 10

D	ditched, minor effect	( )
DD	ditched, major effect	( )
T	tube drained, minor	( )
TT	tube drained, major	( )
M	mole drained, minor	( )
MM	mole drained, major	( )
S	subsoiled, minor	( )
SS	subsoiled, major	( )
R	ridged, listed, minor	( )
RR	ridged, listed, major	( )
I	irrigated, minor	( )
II	irrigated, major	( )
X	raised water, minor	( )
XX	raised water, major	( )



A daily field sheet (for provinces other than Atlantic) showing an example of coding of the new SWIG classification, using Special Notes section pending the next overhaul of the form.

II CORRELATION WORKING GROUP

Generalized Soil Landscape Maps

J.A. Shields

Background

Concern was expressed by Dr. Clark that generalized maps were being prepared by different Agencies with very little communication and correlation. Examples cited were the Ecoregion map in preparation by CCELC (Chairman S. Zoltai) and those used in the Multicategorical Classification of Agricultural Land (Kraft et al, 1980).

Preparation of generalized soil landscape maps was encouraged by Dr. Clark who emphasized the growing recognition of their valuable contribution relevant to scientists, educators and public decision makers. He recommended that leadership be provided by the Canada Soil Survey as the basic permanent properties of soils and landscapes comprised an integral part of their inventory program.

It was proposed by Dr. Clark that correlation staff in concert with local Unit Heads be responsible for preparation of these generalized soil landscape maps. Shields was asked to prepare a proposal initiating a Pilot Study Area in the Prairie Provinces but with sufficient flexibility to be extended to other parts of Canada.

In response to this task, a proposal was prepared and circulated to Prairie Unit Heads and Cliff Acton in Ontario who also expressed a sincere interest on this project. The first proposal (Approximation) focussed on title, stratification, differentiating property class limits, legend format and map symbols, guidelines for mapping and the format for an extended legend. Responses to the proposal were reviewed and a subsequent Approximation developed. The last proposal (Feb. 19/81) comprised the 3rd Approximation. More recently, a 4th Approximation comprising a map and legend for Southern Saskatchewan was prepared and displayed at the Workshop Sessions.

Workshop Sessions

Two workshop sessions were held. The first workshop was open to all interested participants. Discussion focussed on topics for which there was general agreement and for minor problems. Topics on which a concensus was reached included:

Objectives: To prepare a generalized map of selected areas showing soil and landscape properties important to plant growth and the use, management and conservation of land.

Clientele: Soil landscape areas should be designed to interest agrologists, ecologists, educators, geographers, foresters and regional land use planners.

Interpretations:

- areas of different Available Water Capacity (AWC)
- water erosion hazard on sloping land
- wind erosion hazard
- sensitivity to acid rain
- relation of differentiating properties to soil moisture deficit, to general land use, to agricultural land use systems and to crop yields.

Landscape properties: Genetic materials, texture of material, surface form and slope gradient.

Soil Properties: In the majority of cases, soil properties diagnostic of the Great Group taxonomic category were considered the most appropriate. Exceptions include poorly drained or weakly developed soils where properties diagnostic of Order level were most appropriate.

Scale: Subsequent to reviewing the data base for the Prairie region it was concluded that the most appropriate scale was 1:1 million. However, a scale of 1:500,000 will be permitted in other regions depending on the data base and complexity of terrain.

The second workshop was held Wednesday morning with only participants present who had previously corresponded. Class limits for differentiating properties were reviewed and a concensus reached on the following:

Genetic materials: Colluvial, eolian, fluvial, lacustrine, morainal, marine, organic (peat), rock, undifferentiated mineral.

Texture classes of genetic materials:

1. sand, loamy sand, gravelly sand
2. sandy loam, fine sandy loam, gravelly sandy loam
3. very fine sandy loam, loam, silt loam
4. very fine sandy clay loam, clay loam, silty clay loam
5. sandy clay, silty clay, clay, heavy clay.

Surface form:

- dissected
- eroded channels
- hummocky
- hummocky with kettles
- inclined
- level
- rolling
- ridged
- steep
- undulating
- veneer

plus organic surface form developed to be in consultation with Charles Tarnocai

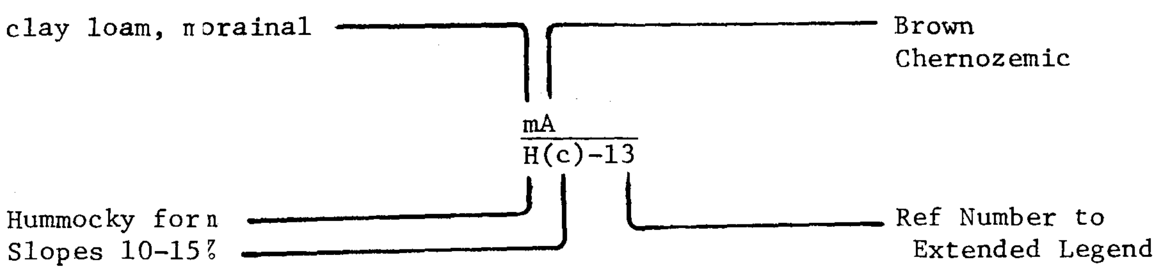
Slope gradiant classes:
(a) 0-3%
(b) 3-9%
(c) 10-15%
(d) 16-30%

Note: additional classes are required for Cordilleran landscapes.

Map symbols on publication map. It was decided that a simple symbol indicating texture of genetic materials, dominant soil, surface form and slope be shown on the map.

This can be accomplished by:
(a) combining texture of materials
(b) arranging and listing them in the texture classes given above
(c) assigning each a lower case alphabetic character commencing with (a) for sandy eolian to (v) for clay lacustrine, or whatever
(d) combining surface form and slope class as in the following example:
H(a) hummocky surface form with slopes of 0-3%
H(b) hummocky surface form with slopes of 3-9%
H(c) hummocky surface form with slopes of 10-15%
H(d) hummocky surface form with slopes of 15-30%
(e) Showing only the dominant soil group
(f) Listing soil groups alphabetically as per Don Acton Legend i.e. A- Brown, B- Dark Brown, C- Black, D- Thick Black etc.

Example of Map Symbol:



Legends

Publication Map Legend. Simple, indicating texture of materials, dominant soil group, surface form and slope gradient, and possibly an asterisk indicating the presence of other significant soils (or landscape features) which would be shown in the extended legend.

Extended Publication Legend. This item was discussed at both sessions and during presentation to the ECSS. In view of these discussions it is proposed that the extended legend be prepared in booklet format with each entry linked to a map reference number. This proposed legend consists of at least 4 modules:

1. Map Symbol Description Module showing:

Map Area No.	Map Symbol	Texture of Material	Genetic Material	Surface Form	Slope Gradiant	Soil Group

Dominant Property; ---- One soil inclusion which occupies at least 25% of an area may be listed following the semicolon. One landscape inclusion which occupies at least 25% of an area may be listed following a semicolon in the appropriate column.

2. Atmospheric Climate Module

Growing Season				
Start	End	Degree-days	Fall Frost	Frost-free days

3. General and Land Use Module

Percent water bodies						
Permament	Type	Periodic	% Cult	% Native	Dom Plant Community	Wetland Type

4. Soil Capability Module

Agric	Forestry	Wildlife	Recreation

Note: Modules on agricultural (or other) land use systems, agronomic yield data for various crops, forest yield data will be compiled by the Land Use and Evaluation Section.

Stratification

A good deal of discussion at both sessions centred on stratification with consensus reached on differentiating criteria for levels 1 and 3. It was agreed to use the Ecoregion map prepared by CCELC (Chairman S. Zoltai) for the initial level of stratification. This map is currently in preparation. Hopefully, in the Southern Prairie Region the Ecoregion boundaries will approximate the major soil zonal boundaries.

The third level of stratification as agreed will consist of the soil landscape polygons. Unfortunately, no consensus was reached as to the differentiating criteria for the intermediate level of stratification.

It was agreed that the level 2 stratum would be derived by agglomeration of level 3 soil landscape polygons. It is proposed that these soil landscape polygons can be agglomerated into sensible ecodistricts (or ecologically significant landscapes). Assuming this can be done, these ecodistricts should also service the needs of the mapping program initiated by the Lands Directorate, DOE. Discussions have already commenced concerning proposals for integrating these projects.

Conclusion

In view of the progress accomplished in the past year, it is feasible that a generalized soil landscape map of Ontario and the Prairie area including the Great Plains part of British Columbia can be prepared with compatible legend and map symbols within a sensible time frame. For the Prairie project it is estimated that 3-4 py are required to complete the map and extended legend.

Recommendation

That the ECSS formally appoint a working group and allocate appropriate personnel and financial resources for continuation of developmental guidelines and preparation of generalized soil landscape maps on a regional basis.

Project Plans, Project Monitoring and Correlation Procedures

John L. Nowland

A. Presentation to workshop

1. At the ECSS Meeting last year the correlation staff in Ottawa inflicted upon you a lot of what I would describe as raw material on soil correlation procedures and project planning and specifications. Predictably, I suppose, some of you reacted as if being force-fed a diet of dehydrated horse manure, which in one dose, threatened to engulf you.

Horse manure has hidden riches, (dozens of mushroom growers can't be wrong) and out of it has emerged a refined and restructured Correlog. The inputs of many individuals over the year are much appreciated, and testing was conducted on several survey projects across the land.

2. In recent years soil survey achieved a stable soil classification system, plus workable adjuncts such as the landform classification. But improvements in soil correlation, and probably also, project management, were held back by uncertainty about what should be used as consistent guidelines for soil mapping systems. Even communication was difficult, with common mapping terms interpreted differently by different people. Progress in the Mapping Systems Working Group has removed many obstacles. The working groups on interpretations will hopefully achieve similar results, but even at this stage I believe we are in a position to make a lot of improvements in the planning, monitoring and correlation of survey projects. I contend that as it stands Correlog is a useful tool for more effective correlation and monitoring of survey projects, that it is a good basis for automatic self-correlation, and that it will reduce significantly problems and inefficiencies we have experienced in map production. I would hope that after whatever inputs you have this week, we can adopt Correlog for trial over a period of years for surveys in which LRRI is involved.

Correlog is, of course, designed to complement an initial survey project plan, with specifications. Such plans presently come in all shapes and sizes, including a popular super-abstract type. For the most part, we embark on mapping projects with a level of planning that many outside project managers would call primitive by today's standards.

I have made a rough draft of a possible standardized outline for project plans. It draws upon many sources, including items from the list John Day presented at the last meeting and ideas from the four people who have so far responded to his solicitation of January 20. Guidelines for some of the items, such as costing, would have to be developed.

We have to decide how detailed such plans should be, bearing in mind such factors as turnover of staff. Depending upon the degree of detail finally agreed upon, overlap with Correlog would be adjusted accordingly; for instance, adoption of the entire draft outline as it stands would suggest deletion of about 15% of the items of Correlog.

However Correlog might as well stay intact for the time being, since it could be applied to projects currently under way, whereas the project outline is possibly further away from agreement and would only apply to new LRRI projects.

4. The purpose of this workshop session was: (a) to review Correlog and obtain your inputs, as indicated when it was sent to you in the mail. (b) to obtain your views on survey project planning, as invited by John Day at the last meeting, and your initial reaction to my outline for plans and specifications. (c) to formulate recommendations to ECSS on these subjects. It would be appropriate to consider the project plan outline before moving on to the monitoring document Correlog.

5. Section A of the Project Plan Outline, Identification, includes a summary to provide a quick outline of the nature of the project. Section B, Project Definition and Objectives, is perhaps one of the more difficult to fill out because it attempts to cover in the authors own words a justification of the project that could be used in priority setting. It also provides a quick scan of the kind of output planned, which is dealt with in detail in a later section.

Section C, Project Management, attempts to lay out the management structure and may need expanding to cope with the more complex cooperative arrangements in some surveys.

Section D, Resources Allocated, deals in detail with the inputs to the project. These are grouped under Staffing, Funding, Equipment, Materials, Transportation and Services to be utilized. The part on funding presents difficulties that will require development of guidelines, but it seems to be important in order to make decisions on possibly more beneficial alternatives for spending our money.

Section E, Survey Operations, is the big one in which the team specifies its approach to meeting the objectives. This is where overlap with Correlog occurs and where adjustments to mesh the two documents will be required. This section and the next one attempt to emphasize early sampling and early planning of interpretive output, among other things.

Section F, lays out the schedule of operations and has some rough edges as yet. The feasibility of networking by such techniques as PERT/CPM has not been tested much for application to soil surveys, and I am not yet sure of how they handle the sequencing of activities when some have seasonal constraints. Enthusiasm for networking as a management tool in other fields suggests that we consider the advantages, if any. The scheduling section has much flexibility in the degree of detail you feel is necessary.

I have included Section C, Risk Assessment, because it is claimed by the experts in project management to be one of the more serious items that is commonly reglected at peril to the project. Provision should be made for contingencies in staffing, funding, unforeseen technical complexity and possible other hitches.

Finally, Section H is based on the assumption that we are interested in promoting our product and sounding out our market, for future reference.

6. Proceeding to Correlog, I refer you to the material I sent out before the meeting.

Correlog .... and how it works

Correlog is a tool for correlating and managing soil survey projects. It provides, among other things:

1. A ready reference list of correlation items that should be monitored at various stages of a project to smooth out progress towards completion.

2. A record in one place of decisions taken to execute, embroider and modify the initial project plan.

Correlog is therefore both an outline of the correlation function, and a quick-reference source on the specifications of the project and any changes through time.

The potential value of such a document has been amply demonstrated by past survey projects, in which communication breakdown, staff changes, overlapping responsibilities, oversights and plain forgetfulness have created situations requiring belated corrective actions. The actions have sometimes been time-consuming and costly. Correlog is therefore a smoothing device, a framework of auto-correlation primarily for the use of party leaders and provincial correlators, and designed specifically to fit existing Canadian situations of survey organization and manpower constraints.

These concepts of Correlog have changed little since the 1st draft of early 1980. My revisions in the 2nd draft owe much to the many valuable suggestions and criticisms received in 1980. Some re-structuring became self-evident during testing on current projects.

Correlog now consists of two parts. The Main list, items 1 to 118, is a condensation of core material (though maybe not condensed enough for some who faulted the size of the 1st draft). I suggest that items on the Main List are rather important areas to be reviewed and settled at the correlation stage(s) indicated.

The Supplementary List, items 119 - 149, covers the less crucial items that some might like to consider optional. These include some "personal checklist' items from the 1st draft, some of them no more than reminders to mappers, others perhaps more significant.

Some who objected to Correlog's size might suggest that the Supplementary List is no more than a device to sneak back in the items lost in condensation. Partly true, but this list is now optional. I am not convinced by the argument that "we don't have the time". It takes no more time to pose the questions all at once, than to do so in dribs and drabs as they come up. (Unless of course, the questions are not posed at all, which has been known to happen). Correlog brings it all together, and saves time by recording in one place, prompting at the right time, and eliminating searches of "who said so and why?". All this, and it is easily photocopied for anyone involved.

The 2nd draft makes occasional reference to the project specifications. Since it is designed partly to monitor the project plan, it can only function as an adjunct to properly documented project specifications, currently being developed.

Correlog is for the use of all soil survey staff, but mainly provincial correlators, unit heads, and project leaders. It is not intended for dissemination. I envisage that the Master Copy for a project would be kept by the provincial correlator or unit head. Regional correlators would have a copy in order to keep track of the issues that come to their desks. When the value of Correlog has been manifested its use should be recommended to cooperating agencies whose projects have a significant LRRI input.

B. Outcome of Workshop

1. The workshop was a very useful exercise, and demonstrated the value of this kind of meeting format. A large measure of agreement was reached on the issues raised, sufficient, I believe, to put forward two recommendations to ECSS.

2. There was a surprising degree of agreement on the draft outline for project plans, but there had been inadequate time for prior study. A need for guidelines in preparing certain parts of the plan, such as funding, was identified.

3. A large majority favoured Correlog as presented. Concerns were expressed that it mixes up correlation and coordination functions, and that "correlation" should be more clearly defined.

of personal performance by those having no business to do so, or by those who would do it by less visible means. The intention is to evaluate the activity, not the person. One or two people felt that many items in Correlog are dealt with verbally in an adequate manner. The name Correlog was questioned, since the document covers much that is not correlation, sensu stricto.

5. Despite the concerns of a minority, I justified the submission of the following recommendations on the grounds that:

(i) the workshop came very close to consensus, and the proposals received strong support from a cross-section of field mappers who would be most affected.
(ii) the value of Correlog was substantiated during testing in the field on 5 projects in 1979-80.
(iii) there is evidence that our colleagues in related fields, such as land evaluation, would benefit from soil survey ordering its affairs in this way.

Recommendations to ECSS 1981

1. That the draft outline for project plans, to be called Survey Form 1, presented to this Meeting be approved by the Expert Committee on Soil Survey as the basis for soil survey project plans, subject to the following conditions.

   i) allow for minor revisions emanating from further review until a cut-off on May 1.

   ii) guidelines to be developed on how to calculate funding and prepare other sections of the plans, as required.

2. That the 2nd draft of the document Correlog, re-named Survey Form 2, be the basis for correlating the monitoring soil surveys, subject to the following conditions.

   i) allow for minor revisions emanating from further reviews until a cut-off on May 1 (these revisions include deletion of items duplicating the approved outline of project plans).

   ii) make changes to emphasize that evaluations are of survey activities, not people.

   iii) drop the name Correlog in recognition that the document is a record of many things other than soil correlation in the traditional sense.

   iv) incorporate in the forthcoming Soil Survey Handbook a definition of correlation and correlation roles, and modify "Correlog" to fit the concepts defined therein.

SOIL SURVEY FORM 1 - SOIL SURVEY PROJECT PLAN - OUTLINE

A. IDENTIFICATION

B. PROJECT DEFINITION AND OBJECTIVES

C. PROJECT MANAGEMENT

D. RESOURCES ALLOCATED

E. SURVEY OPERATIONS

F. SCHEDULE OF ACTIVITIES

G. RISK ASSESSMENT

H. PUBLIC INFORMATION AND FEEDBACK

APPENDIX. Checklist of information supplied in the map legend.

SOIL SURVEY PROJECT PLAN

A. IDENTIFICATION

A1 Title & project no.: ______________________

A2 Originator: ______________ A3 Date filed: __________

A4 Reviewed by: ______________ ______________ ______________
(unit head) (provincial correlator) (regional correlator)

A5 Location & geographical situation: ______________________

A6 Summary statement (< 100 words on objectives, area, agencies, staff, dates, cost, ie. highlights of following material, abstracted last).

B. PROJECT DEFINITION AND OBJECTIVES

B1 Requirement. 1. Requested by: ______________________

or 2. Part of long-term plan of: ______________________

B2 Relevant background of the requirement, including reasons of the originator (< 100 words):

B3 Purpose and objectives: Define the information requirement (< 100 words):

Use of information for agricultural, forestry, urban, planning, soil/land research, other concerns (underline or specify):

Identify the kinds of decisions to be made on the basis of the survey information:

Determine, if possible, the impact of errors or unidentified contrasting inclusions on the kinds of decisions to be made:

B4 Output (summary - details in E9, E10, E11)

Interim maps - number:____________ SIL:________ Scale:____________

Final maps - number:____________ SIL:________ Scale:____________

Interpretive maps - approx. number of categories: ____________

Kind of report(s): internal ( ), provisional/interim ( ), final ( ), expanded legend ( ), none ( ).

Style of report(s): technical ( ), wide readership ( ), both ( )

Interpretive pamphlets: ( ) open-file data ( )

C. PROJECT MANAGEMENT

C1 Implementing agencies:

C2 Coordinating agencies:

C3 Cooperating agencies:

C4 Contractor(s):

C5 Contract supervision:

C6 Arrangements for input of user groups:

C7 Management structure: (line of authority, role of technical, advisory committees, coordinating and monitoring, etc.).

D. RESOURCES ALLOCATED

D1 Staffing: Project leader, pedologists, technicians, laboratory, casuals, resource persons, correlators.

Name	Function	Tasks, special responsibilities	Years assigned

Number of survey parties and assignment of areas:

Training requirements (e.g. airphoto interpretations, geology, languages, project management, etc.):

D2 Services. Identify the kind and supplier of services required from outside the survey unit; if any:

Consulting/contracted items:

1

2

3

Data acquisition:

Data processing:

Research:

Laboratory analysis:

Engineering tests:

Cartography:

Word processing/secretarial:

Miscellaneous items:

D3 Transportation requirements

Land vehicles:

Boats:

Airborne:

Miscellaneous items:

D4 Equipment requirements

Basic hand tools, drills, backhoes; etc:

Surveying instruments, cameras etc.:

Lab and field investigation instruments:

Office equipment

Cartography equipment:

Camping equipment:

D5 Materials requirements

Map bases:

Airphotos:

Drafting materials:

CanSIS forms:

Office materials, stationary:

Lab reagents:

Miscellaneous items:

D6 Funding

Sources:

Approval and monitoring arrangements (contracts):

Methods of disbursement and reimbursement (contracts):

D6. SOIL SURVEY COST ESTIMATES. (use another sheet for Year 4 plus).

Category of expenditure.	Salaries and wages			Contract fees			Travel & subsistence			Gas, oil, tires			Repairs			Materials other than for vehicles			Rental (all)			Subtotals			Tot
ACTIVITY	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	
MAPPING																									
SAMPLING																									
CORRELATION																									
SPECIAL FIELD PROGRAMS																									
DATA ACQUISITION																									
RESEARCH																									
LAB ANALYSIS																									
MAP COMPILATION																									
CARTOGRAPHY																									
REPORT WRITING																									
REPORT EDITING																									
OTHER ITEMS.																									
SUBTOTALS																									
TOTALS																									

E. SURVEY OPERATIONS

E1 Preparation Activities: Indicate any special requirements, plans or allocation of tasks for:

Preliminary airphoto interpretation:

Gathering background information:

Public information:

Landowner liaison, permission for access, etc.

Other:

E2 Broad Mapping Strategy

Legend-building fieldwork plan:

General strategy for coverage of area:

Traverse interval and access:

Average ground inspection density:

Estimated rate of progress:

E3 Mapping System

Survey intensity level: _______

Scales. Field compilation maps: ___________ Airphotos: ______________

Interim maps: ___________ Final maps: ______________

Minimum size map delineation:

Guidelines - use of daily field sheets:

- use of CanSIS detailed forms:

Kind of map legend - closed, controlled, uncontrolled, open.

- working legend:

- final legend:

Categories of information in legend(s) (refer to checklist appended and underscore items used as column headings in final legend).

Legend placement - on face of map, in report, extended.

Use of transecting for determining variability of map units?

Identify the differentiating properties of named map units, including taxonomic level used.

Method of naming soils:

Use of open phases:

Example of working map symbolization with key,

Example of final map symbolization with key,

Other mapping system items:

E4 Correlation and Monitoring

By Soil Survey Form 2 (Correlog) or modified (reasons):

Other provisions:

E5 Soil sampling strategy

Planned intensity (per unit area, soil or map unit):

Amounts of kinds of samples (loose, cores, engineering):

Grab sampling guidelines (specific problems):

Planned formal sampling schedule relative to mapping stages and correlation levels:

Are sample sites to be shown on final map?

Special sampling requirements for research projects:

E6 Lab Analyses

Chemical determinations to be performed:

Physical determinations:

Pedotechnical determinations:

Identify lab(s) doing analyses:

Estimated numbers of samples and scheduling to each lab:

Quality control measures - use of CSSS reference sample?

E7 Field measurements. Indicate intentions and methods:

Overall strategy (no. of sites, nature, emphasis etc.):

Soil water, water table, transmissibility:

Soil Temperature:

Precipitation:

Bulk density, coarse fraction:

Soil strength, bearing capacity:

Erosion:

Crop yields:

Forest productivity:

Other:

E8 Research Needs

Proposal(s) for (or schedule a review of) possible research projects:

E9 Interpretations

Categories of interpretations in the Report (see checklist, appended)

Categories to be supplied as map retrievals (see also item E10 below):

Categories to be presented on microfiche:

Categories to be prepared after publication, or as supplements:

Specify if interpretations by named soils or by map units:

Specify basis for interpretations, i.e. estimated in field during survey, estimated in office at level 4, averaged from a number of ratings, estimated in field and revised on basis of lab data:

Identify special data needs for interpretations:

Use of soil potential ratings (USDA-SCS):

E10 Map Preparation (see also item B4)

Kind of map base, interim and final maps:

Where are interim maps to be prepared?:

Estimated scheduling of interim maps:

Request digitization of interim maps, with reasons:

Number of copies of interim maps:

Where are final maps to be prepared?:

Number of copies of final map:

Requirement for map unit area measurements, and date:

Specifications for generalized soil map(s) (scale, size, loose or bound, digitization, B & W or colour)

Specify categories of information (soil and land attributes) for CanSIS retrieval extended legend:

Other specifications for computer - plotted interpretive maps (scheduling, scale, enchancement etc - see E9):

Other map preparation items:

E11 Reporting (see also item B4 for kind and style)

Size of report(s), approx. no. of MS pages:

Dimensions of report(s):

Language(s):

Number of copies (interim): (final)

Figures. Approximate nos. of line drawings, (text maps, cross sections, block diagrams) B & W photos, colour photos:

Where will final line drawing be prepared? (LRRI Cartography, Research Program Services, other):

Use of microfiche for tables, text maps, interpretations etc.

Outline of chapter or section headings:

Planned manuscript review routing:

Additional report design requirements (cover, packaging etc.):

Designated distribution agency:

F. SCHEDULE OF ACTIVITIES

(Schedule is not strictly sequential because of overlapping functions)

F1 Preparatory Phase

Start-up date:__________ Completion date: __________

Bar chart time scale, or networking (critical path scheduling). Attach.

Approval of project plan:__________

Contract. Complete draft: __________ Complete review of draft:__________

Contract finalized:__________

Acquire airphotos, imagery: __________

Other preparatory items:__________

Complete preparatory phase:__________

F2 Mapping and Correlation

Complete legend - building fieldwork, airphoto pre-typing etc:__________

Complete 1st draft working legend: __________ (milestone 1)*

Complete 1st draft final legend: __________

Planned mapping coverage (year 1, 2, etc): __________ __________ __________

__________ __________ __________

* Milestones are events the accomplishments of which signifies some key meaningful and measurable progress towards success of the project. They are visible indicators of production. Eleven milestones have been identified, but many projects would not use them all; you may wish to identify additional ones.

Probable dates of correlation field reviews: _________ _________ _________

(Milestones 2,3 and 4) (level 1) (level 2) (level 3)

F3 Soil Sampling, Analysis, Measurements

Percent of sampling target to be completed by: CL1 _____ CL2 _____ CL3 _______

Percent of planned lab data to be available by: CL1 _____ CL2 _____ CL3 _______

Complete sampling:

Complete establishment of field measurement sites: _______________

F4 Interpretations

Schedule meetings of technical experts and users on the design of interpretations: ______________________

Complete 1st draft of interpretive ratings (as designated): _________

Complete final interpretive ratings: (Milestone 5) _________

F5 Map preparation

Acquire map bases: ______________________

Complete and issue draft interim maps, 1st sheet: _______
subsequent sheets: _______ _______ _______

Submission of completed manuscript final map to cartographers,
1st sheet: (Milestone 7) _________
subsequent sheets: _______ _______ _______

Require delivery of final map: (Milestone 8) _________

Submit coding forms or extended legend for computer - derived interpretive maps: ______________________

Require delivery of generalized map: ______________________

F6 Written report

Complete outline of contents of final report: ______________________

Complete reviews and issue interim report: (Milestone 6) _________

Complete 1st draft interim report: ______________________

Complete 1st draft of final report: (Milestone 9) _________

Complete internal reviews of final report: ____________

Complete professional editing of final report: (Milestone 10) ____________

Require delivery of final report: (Milestone 11) ____________

Complete interpretive supplements to Report, guides to users, etc: ____________

G. RISK ASSESSMENT

G1 Identify possible failure points in project plan or slippage in schedule (staffing, funding, technical complexity, etc.):

G2 Determine possible consequences of each failure or slippage:

G3 Contingency plans for high-impact failures:

H. PUBLIC INFORMATION AND FEEDBACK

H1 Distribution arrangements for report/maps:

H2 Plans for public information meetings:

H3 Plan for collection of user feedback response:

Appendix

Checklist of categories of information supplied in the map legend.

- classification of dominant and significant soils
- climate
- parent material and origin
- landform surface expression
- lithology
- soil depth
- drainage or soil water regime
- erosion
- soil fertility
- soil reaction, salinity
- stoniness, rockiness
- vegetation
- humus form
- wetlands classification
- water bodies
- land use
- CLI agriculture
- CLI forestry
- CLI recreation, wildlife
- soil suitability (specify uses)
- other interpretations (specify)
- 2 dimensional cross sections
- block diagrams
- surveyor & cartography credits

SOIL SURVEY FORM 2 (CORRELOG)

(LRRI Soil Survey Correlation and Monitoring Record)

INSTRUCTIONS

This document is filled out by the provincial correlator during the first (Level 1) correlation tour (field review), and retained as a record of progress towards objectives in the initial project plan, problems encountered, decisions taken and actions required. The basic procedure calls for updating during two further field tours (Levels 2 and 3) and a final office review. Items in Correlog should generally receive attention at the levels indicated for each item.

Correlation Levels

The four correlation levels are as follows:

Level 1: approximately 25% of mapping completed
Level 2: " 50% " " "
Level 3: mapping completed
Level 4: final correlation, map compilation and reporting phase.

For projects of less than 3 years duration, Level 1 and 3 reviews may be omitted. In this case, items that would otherwise be considered at those levels should be included in a composite Level 2 review. Level 2 might then occur at any time during mapping, preferably after 25% of the mapping is completed. For projects of less than 4 years duration, Level 1 may be omitted and the items included in Level 2.

Where a map area has been compartmented, following recent suggestions, into a number of shorter-term or annual sub-projects (e.g. quadrants of a map sheet or county, rural municipality, or scattered watersheds, reserves or parks) some adjustment of the above guidelines is necessary. The first correlation review, which would take place in the area of sub-project 1, should be a composite review that covers all items from Levels 1, 2 and 3, so that it could proceed to the stage of an interim map and report in Year One. This review should consider the impact of observations and decisions on the subsequent sub-projects covered by the project specifications. Plans should be made on an ad hoc basis at this time for later Level 2 and 3 reviews in subsequent sub-project areas as required, and avoiding unnecessary duplication of effort over the project as a whole.

In the situation described above, the Level 3 and 4 reviews will give special attention to tying up later sub-projects with the earlier ones and any correlation problems that have arisen.

Content

The document consists of a mandatory Main List (items 1 to 107), containing essential items, and an optional Supplementary List (items 108 to 116) to record additional data as required by the provincial correlator. "Change Sheets" are appended as a permanent record of details of changes agreed upon and actions taken, for which there is insufficient room on the Lists just mentioned.

On the Main and Supplementary Lists there is provision for recording data, evaluating each item and noting actions required or actions taken. Problems identified in the evaluation require action before the next correlation level review. Wherever appropriate, entries are facilitated by ringing an appropriate symbol.

Agreement by the parties concerned is shown by signatures on page 1.

SOIL SURVEY FORM 2 (CORRELOG)

Name of project: ______________________________

Province: ____________________ Leader: ____________________

Dates of correlation reviews:
Level 1 __________ Level 2 __________ Level 3 __________ Level 4 __________

Approval signatures:

	Level 1	Level 2	Level 3	Level 4
Project leader				
Provincial correlator:				
Regional correlator:				

SUMMARY OF CONTENTS

MAIN LIST ITEM NOS	ITEM	SUPPLEMENTARY LIST ITEM NOS
1	Mapping Progress	--
2-5	Mapping System (general)	108-110
6-10	Working Map Legend	--
11-21	Final Map Legend	111-114
22-42	Map Units	--
43-48	Map Symbols	--
49-69	Map Preparation and Scheduling	--
70-73	Soil Sampling	115-116
74-77	Lab Analyses (Field Measurements)	
78-80	Profile Descriptions	--
81-86	Soil Report (Specs and Content)	--
87-93	Soil Report (Progress)	--
94-105	Correlation Activities	--
106-107	Miscellaneous Items	--

Correlation Change Sheets.

Appendix. Checklist of categories of interpretations.

SOIL SURVEY FORM 2 (CORRELOG) MAIN LIST

ITEM NO.	ITEM	APPLICABLE CORRELATION LEVEL	DATA RECORD, EVALUATION OF ITEM, OR ACTIONS REQUIRED	ACTION TAKEN (✓) CHANGE SHEET # (if any)
MAPPING PROGRESS				
1	Percent mapped to date. Evaluation of rate of progress.	1 2 3	___% ___% ___%	
MAPPING SYSTEM (general)				
2	Does mapping system accord with project plan, item E3?	1 2 3		
3	Use of daily field sheets	1 2 3		
4	Distribution of traverses through survey area during legend building	1		
5	Does mapping system accord with current national guidelines	1 2 3		
WORKING MAP LEGEND				
6	Closed, controlled, uncontrolled or open?	1 2 3	CL CO UN OP CL CO UN OP CL CO UN OP	

ITEM NO.	ITEM	APPLICABLE CORRELATION LEVEL	DATA RECORD, EVALUATION OF ITEM, OR ACTIONS REQUIRED	ACTION TAKEN (CHANGE SHEET # (if any)
7	Framework of legend stratification used: climate (C) ecoregions (E) soil zones (Z), vegetation (V) geology (A), physiography (P) none (N), other (O-specify) Indicate order if 2 or more ringed	1 2	C E Z V G P N O	
8	No. of primary stratification classes	2	_____	
9	Approximate numbers of "named" map units (usually different colours on final map)	1 2 3 4	__ __ __ __ __ __	
10	Do the categories of information in the legend conform with the initial project plan, item E3?	1 2 3	Y N Y N Y N	
FINAL MAP LEGEND				
11	Closed, controlled, uncontrolled or open?	1 2 3	CL CO UN OP CL CO UN OP CL CO UN OP	
12	Placement of legend(s) used: on map (M), in report (R), extended legend (E). Ring one or more	1 2 3	M R E M R E M R E	
13	Framework of stratification used: any change from working legend? (see items 7 and 8)	1 2 3		

ITEM NO.	ITEM	APPLICABLE CORRELATION LEVEL	DATA RECORD, EVALUATION OF ITEM, OR ACTIONS REQUIRED	ACTION TAKEN ( ) CHANGE SHEET # (if any)
14	Approximate nos. of named map units (usually different colours on final map)	2 3	___ ___ ___ ___ ___ ___	
15	Categories of information to be supplied in the legend(s) - any change from project plan, item E3?	1 2 3		
16	Does the legend adequately define the content of map units?	2 3	Y N Y N	
17	Meaning of "dominant", "significant" and other terms clearly defined?	3 4	Y N Y N	
18	Soils/landscapes relationships clearly described?	3 4	Y N Y N	
19	Fieldwork access/mapping density map	1 2	Y N Y N	
20	Refined version of item 19 showing map reliability as function of number of soils in map units (complexity) x observation density	1 2	Y N Y N	
21	Key to conventions, symbols etc.	4	Y N	

MAP UNITS

The following items refer to final map, except where stated.

ITEM NO.	ITEM	APPLICABLE CORRELATION LEVEL	DATA RECORD, EVALUATION OF ITEM, OR ACTIONS REQUIRED	ACTION TAKEN ( ) CHANGE SHEET # (if any)
22	Indicate level of taxonomy used in map units. Evaluate appropriateness.	1 2 3	________ ________ ________	
23	Use of open phases (i.e. cartographic subdivisions of map units indicated by characters in the symbol and not covered by description of map unit) - slope (T), stoniness (P) rockiness (R), erosion (E), surface texture (S), depth (D), parent material variation (PM), drainage (W) soil variants (V), other (specify).	1 2	Working Final T T P P R R E E S S D D PM PM W W V V	
24	Have the taxonomic categories and named map units been correlated with a provincial master list and previously mapped areas?	1 2 3		
25	Have new soil names been <u>reserved/</u> <u>established</u> in Soil Names File?	2 3	Y N / Y N Y N / Y N	
26	Establishment and documentation of range of properties for each taxonomic category and named map unit, with identification of competing units.	1 2 3	Y N Y N Y N	
27	Are the defined range of properties of map units appropriate for interpretations planned?	1 2 3	Y N Y N Y N	

ITEM NO.	ITEM	APPLICABLE CORRELATION LEVEL		DATA RECORD, EVALUATION OF ITEM, OR ACTIONS REQUIRED	ACTION TAKEN (✓) CHANGE SHEET # (if any)
28	Have small map units of limited occurrence been amalgamated with others?	2 3 4	Y N Y N Y N		
29	Have map units separated on the basis of soils that occupy < 15% of the map unit area been amalgamated with others?	2 3	Y N Y N		
30	Have compound map units in which minor "similar and non limiting" soils occupying < 35% been amalgamated with the single map unit of the dominant soil?	2 3	Y N Y N		
31	Observed accuracy of map unit boundaries	1 2 3			
32	Observed accuracy of airphoto interpretation	1 2 3			
33	Observed accuracy of designated content of map unit delineations	1 2 3			
34	Are statements of accuracy justified by the intensity of observations?	1 2 3	Y N Y N Y N		
35	Use of transect or grid sampling for the statistical determination of variability of map units. Indicate % of map units covered.	Y N	_____%		

ITEM NO.	ITEM	APPLICABLE CORRELATION LEVEL		DATA RECORD, EVALUATION OF ITEM, OR ACTIONS REQUIRED	ACTION TAKEN ( ) CHANGE SHEET # (if any)
36	Ditto, for variability of diagnostic criteria (soil & land attributes)	1 2 3	Y N		
37	Ditto, for variability of interpretive ratings within map units	1 2 3	Y N		
	Do the map units conform to the Mapping System Guidelines, as follows:	1 2 3			
38	- grouping and discrimination of properties have maximum utility and predictability?		Y N		
39	- inclusions and unidentified features reduced to a minimum?		Y N		
40	- high repetitiveness and low uniqueness of delineations?		Y N		
41	Use of CanSIS in building and sorting map units? Elaborate.	1 2	Y N		
42	Percentage thresholds used for components of map units to be classed as dominant, significant and inclusions	1 2 3	D____% S____% I____%		
MAP SYMBOLS					
43	Working and final map symbols - any change from project plan, item E3?	1 2 3	Y N Y N Y N		

ITEM NO.	ITEM	APPLICABLE CORRELATION LEVEL		DATA RECORD, EVALUATION OF ITEM, OR ACTIONS REQUIRED	ACTION TAKEN (✓) CHANGE SHEET # (if any)
44	Are symbols on working maps legible?	1 2 3	Y N Y N Y N		
45	Size of symbols on working map is compact (C), medium (M), large (L)	1 2 3	C M L C M L C M L		
46	Are symbols on final map legible?	2 3 4	Y N Y N Y N		
47	Size of symbols on final map is compact (C), medium (M), large (L)	3	C M L		
48	Has the symbol format been approved by Cartography?	1 2 3	Y N Y N Y N		
MAP PREPARATION AND SCHEDULING					
49	What % of thematic transfer has been completed?	1 2 3	___% ___% ___%		
50	Have map base requirements been discussed with the cartographer?	1	Y N		

ITEM NO.	ITEM	APPLICABLE CORRELATION LEVEL	DATA RECORD, EVALUATION OF ITEM, OR ACTIONS REQUIRED	ACTION TAKEN (✓) CHANGE SHEET # (if any)
51	Have map bases been requisitioned?	1 2	Y N Y N	
52	Any revision of estimated dates of submission of completed maps to LRRI Cartography, or equivalent cartography office (specify)? (see project plan, item F5).	2 3	_____(1st interim) _____(2nd interim) _____(3rd interim) _____(final)	
53	Has map unit colour selection been discussed with the cartographer?	3 4	Y N Y N	
54	Has colour selection been coordinated with previous adjacent maps?	3 4	Y N Y N	
55	Is digitization of interim map(s) requested? (e.g. to obtain early area measurements)	1 2 3	Y N Y N Y N	
56	Categories of CanSIS interpretive map retrievals to be issued <u>with</u> the published Report. Any change from project plan, item E9?	2 3		
57	Categories of CanSIS interpretive map retrievals to be issued <u>after</u> publication of Report, or instead of Soil Map. Any change from project plan, item E9?	3 4		
58	Evaluate suitability of statements and definitions in extended legend for CanSIS map retrieval.	3 4		

ITEM NO.	ITEM	APPLICABLE CORRELATION LEVEL	DATA RECORD, EVALUATION OF ITEM, OR ACTIONS REQUIRED	ACTION TAKEN (✓) CHANGE SHEET # (if any)
59	Do statements in extended legend for CanSIS map retrieval accord with rating procedures and tabular interpretive sections in the Report?	3 4		
60	Scheduled dates of submission of coding forms for CanSIS interpretive retrievals. (Specify if more than one) Any change from project plan, item F5?	3	1_____ 2_____ 3_____	
61	Review of map and legend by provincial correlator - date completed	3 4	interim 1st_____ 2nd_____ 3rd_____ final ______	
62	Review of map and legend by regional correlator - date completed	3 4	interim 1st_____ 2nd_____ 3rd_____ final ______	
63	Date(s) interim map(s) issued		1st_____ 2nd_____ 3rd_____	
64	Date drafting/digitization of final map commenced	4	_____	
65	Date correction copy of final map sent to author	4	_____	
66	Date correction copy returned to cartographer	4	_____	
67	Date map unit area measurements required by / supplied to author	3 4	_____/_____	
68	Special requests to cartographer (record on a Change Sheet).	3 4		
69	Generalized map base and specs finalized with cartographer, if applicable	3	Y N	

ITEM NO.	ITEM	APPLICABLE CORRELATION LEVEL	DATA RECORD, EVALUATION OF ITEM, OR ACTIONS REQUIRED	ACTION TAKEN CHANGE SHEET (if any)
SOIL SAMPLING				
70	Is formal sampling on schedule as specified in project plan, items E5, F3? If not, indicate % of target for this stage completed.	1 2 3 4	Y N ___% Y N ___% Y N ___% Y N ___%	
71	Percent of total formal sampling completed	1 2 3	___% ___% ___%	
72	Completeness of sampling - are no. of horizons and depths adequate?	1 2 3	Y N Y N Y N	
73	Grab sampling (to hit specific problems). Evaluate.	1 2 3		
LAB ANALYSES				
74	Planned set of analyses is comprehensive (G), minimum acceptable or confined to soil classification parameters (F) or inadequate (P).	1 2	G F P G F P	
75	Ditto, completed set of analyses	2 3	G F P G F P	
76	Were the CSSS reference soil samples used to monitor most determinations?	2 3	Y N Y N	
77	Have analysis results been entered in CanSIS?	3 4	Y N Y N	

ITEM NO.	ITEM	APPLICABLE CORRELATION LEVEL	DATA RECORD, EVALUATION OF ITEM, OR ACTIONS REQUIRED	ACTION TAKEN ( ) CHANGE SHEET # (if any)
PROFILE DESCRIPTIONS				
78	Quantity (evaluate)	1 2 3		
79	Quality, eg completeness of properties recorded.	1 2 3		
80	Entry of descriptions in CanSIS	1 2 3	Y N Y N Y N	
SOIL REPORT (SPECS AND CONTENT)				
81	Any change from project plan items B4 and E11 with respect to kind, style, dimensions, languages, number of copies and figures?	1 2 3 4	Y N Y N Y N Y N	
Interpretations in the Report.				
82	Do interpretions in the Report conform to the project plan, item E9? Evaluate.	2 3 4	Y N Y N Y N	
83	Evaluation of interpretations, (planning, preparation, presentation, progress). Refer to appended checklist.	1 2 3 4	Indicate basis of interpretations: A. estimated in field during the Survey B. estimated in office at Level 4 C. averaged from a number of variable ratings D. estimated in field and revised on basis of lab. data. N. no interpretation	

ITEM NO.	ITEM	APPLICABLE CORRELATION LEVEL	DATA RECORD, EVALUATION OF ITEM, OR ACTIONS REQUIRED	ACTION TAKEN (CHANGE SHEET # (if any)
83 (cont'd)				
84	Explanation of interpretive criteria	3 4		
85	Ease of understanding interpretations	3 4		
86	Is there clear indication of availability of interpretive retrievals?	4	Y N	
SOIL REPORT (PROGRESS)				
87	Any revision of completion target dates from project plan, item F6 - interim 1, 2, 3. - final	2 3 4	1_____ 2_____ 3_____ ______ ______	
88	Planning of specs and contents: not started (N), in preparation (P) completed (C). Specify kind of report referred to, if more than one. (see project plan item B4)	1 2 3 4	N P C N P C N P C N P C	
89	Outline of contents: not started (N), in preparation (P), completed (C)	1 2 3 4	N P C N P C N P C N P C	

ITEM NO.	ITEM	APPLICABLE CORRELATION LEVEL	DATA RECORD, EVALUATION OF ITEM, OR ACTIONS REQUIRED	ACTION TAKEN (✓) CHANGE SHEET # (if any)
90	Progress with text: not started (N) < 25% (A), 25-75% (B), > 75% (C)	1 2 3 4	N A B C N A B C N A B C N A B C	
	Manuscript review (specify interim or final):			
91	- technical review & style edit by provincial correlator completed (date)	3 4	______ ______	
92	- technical review by regional correlator completed (date)	3 4	______ ______	
93	- professional editing by Research Program Services, Agric. Canada, or equivalent (identify).	4	______(date submitted) ______(date re-submitted) ______(date completed).	
CORRELATION ACTIVITIES				
	Availability of information material on correlation review tours (Evaluate where appropriate)			
94	- airphotos, soil field map	1 2 3	Y N Y N Y N	

ITEM NO.	ITEM	APPLICABLE CORRELATION LEVEL		DATA RECORD, EVALUATION OF ITEM, OR ACTIONS REQUIRED	ACTION TAKEN (✓) CHANGE SHEET # (if any)
95	- working legend	1 2 3	Y N Y N Y N		
96	- draft final legend	2 3	Y N Y N		
97	- documentation of existing and proposed map units and taxonomic categories, including criteria for differentiation from competing units	1 2 3	Y N Y N Y N		
98	- records of random transect results (or other measures of map unit reliability)	1 2 3	Y N Y N Y N		
99	- soil analytical data and results of field measurements	1 2 3	Y N Y N Y N		
100	- climatic data.	1 2 3	Y N Y N Y N		
101	- relevant data and maps on geology, vegetation communities, land use, crop yields, forest productivity, soil performance	1 2 3	Y N Y N Y N		

ITEM NO.	ITEM	APPLICABLE CORRELATION LEVEL		DATA RECORD, EVALUATION OF ITEM, OR ACTIONS REQUIRED	ACTION TAKEN (✓) CHANGE SHEET # (if any)
102	Was correlation tour information material supplied to participants in advance (A), on tour (B), unavailable (C)?	1 2 3	A B C A B C A B C		
103	Comments or additional information about correlation tours	1 2 3			
104	Where the project is composed of a number of sub-projects with individual interim maps, has correlation of these been completed? Indicate any problems.	3 4			
105	Plans for next correlation review - date, level, participants	2 3 4			
MISCELLANEOUS ITEMS					
106	Evaluation of actions required from previous correlation review	2 3 4			
107	Public information meeting(s) planned? Indicate whether before or upon completion of project	2 3 4	Y N Y N Y N		

SOIL SURVEY FORM 2 (CORRELOG) SUPPLEMENTARY LIST

ITEM NO.	ITEM	DATA RECORD and EVALUATION OF ITEM ACTIONS REQUIRED	ACTION TAKEN CHANGE SHEET (if any)
MAPPING SYSTEM (general)			
108	Is SIL uniform across map?	Y N	
109	Average size map delineation	___	
110	Map texture intensity ratio	___%	
FINAL MAP LEGEND			
111	Is map unit stratification adequately explained?	Y N	
112	Are legend units arranged alphabetically for whole legend or alphabetically within stratified groups?	Y N (whole legend) Y N (within strata)	
113	Are single and compound map units kept separate?	Y N	
114	In what respects does the legend differ from the current concept of a standard legend format for the province at this SIL?		
SOIL SAMPLING			
115	Special detailed sampling, eg. research projects? Describe.	Y N	
116	Were random transects used in sampling map units or soils?	Y N	

CORRELATION CHANGE SHEET for ______________________________
(name of project) Correlation Level 1 2 3 4 (ring)

Item no.	Review date	Particulars	Initials

APPENDIX. Checklist of categories of interpretations.

AGRICULTURE

CLI agriculture - basic
- expanded
Suitability for crops:
- field crops
- forage
- vegetables
- tree fruits
- small fruits
- irrigated crops
- pasture and range

Suitability for farming systems
Suitability for other agric. uses
Crop yield potential
Other agric. interpretations (specify)

FORESTRY

CLI Forestry
Forest productivity potential
Suitability for tree species
Seedling regeneration
Forest access roads
Other forestry interpretations

EXCAVATION AND BUILDING

Shallow excavations
Housing in general
Houses with basements
Houses without basements
Local roads and streets
Pipeline construction

WASTE DISPOSAL

Septic tank absorption fields
Sewage lagoons
Sanitary landfill

RECREATIONAL DEVELOPMENT

Recreation potential
Picnic areas
Campsites
Playgrounds
Paths and trails

SOIL POTENTIAL RATINGS (USDA)

SOURCES OF MATERIALS

Topsoil
Fill
Sand
Gravel
Peat moss

WATER CONTROL

Ponds and reservoirs
Embankments, dykes etc.
Drainability
Grassed waterways

MISCELLANEOUS

Suitability for urban develo
Development difficulty
Erosion hazard
Trafficability
Identification of specified
Other engineering uses
Other interpretations

Soil Survey Procedures Handbook

J.H. Day

A proposal to undertake the compilation of a handbook of procedures for organizing and conducting soil surveys in Canada was presented to ECSS in March 1980. The objectives then stated were two-fold; first, to prepare a handbook of soil survey procedures, and second, to prepare a suite of less technical manuals suitable for teaching at university and technical school levels and for general public comsumption.

The recommendations presented were the following.

1. that ECSS undertake the compilation of a handbook of soil survey procedures
2. that the chairman appoint an editor-in-chief, and members of an editorial lead committee who would be charged with the development of the outline of the manual, and the designation of potential chapter editors and topic authors.
3. that persons appointed to editorial functions be permitted by their employers to travel to meetings

Discussion of the proposal revealed that our most important need is to document procedures in use for the purpose of establishing uniformity of standards and methods to the highest degree possible. It was also concluded that the suite of less technical teaching manuals should be assigned a lower priority, but that their ultimate compilation was desirable. In contrast, it was further concluded that packages of information on interpretations of soil useful to the public should be assigned a high priority.

The participants at the second meeting of ECSS indicated their general acceptance in principle of the proposal to document our procedures.

What is meant by "procedures"? By this is meant the procedures employed in conducting all aspects of soil surveys, other than the technical ones such as soil classification, mapping systems or soil water classification. Most of these have been adequately considered in this committee. The document needed must describe, especially for the benefit of younger soil surveyors, the channels and pathways that are followed.

But, you may ask, isn't this primarily a federal concern? No it is not uniquely a federal problem. Surveyors of both provincial and federal agencies plan cooperative projects and share the work at all levels of intimacy. They coauthor soil reports and maps. They share costs of publication. They nearly all use a common data system, and a common cartographic service. They cosponsor training and professional development. Budgets that are increasingly constrained by inflation and by cutbacks demand increased efficiency from them all.

exemplify the need for documentation of procedures.

- What channels must a surveyor follow when wanting to register soil names for use in his area?
- What are the channels to follow when submitting a map legend to cartography and a soil report to RPS for publication; have all requisite quality checks been performed by the author, provincial correlator and national correlator?
- What are the channels to follow when submitting soil samples to LRRI analytical service section?
- What are the norms for survey production at various SIL?
- How is employee performance appraised?
- How are proposals for research fed through ECSS and translated into work plans?
- How is supervision of projects exercised and needed improvements implemented?

With these concerns in mind I would like to call for the establishment of an editorial lead committee. The objective of this lead committee is to determine the content of this publication, based on the proposals received from the members of the lead committee. The persons hereby asked to serve on the lead committee are the following:

R. Louie B.C.	C. Tarnocai
J.D. Lindsay ARC	J.L. Nowland
J.G. Ellis SIP	J.A. Shields
R. van den Brock OMAF	J. Dumanski
M. Tabi QDA	G.M. Coen
J. MacMillan NBDA	J.H. Day
K. Guthrie NFDA	editor-in-chief

Gerry Coen will begin a transfer of work in June at Ottawa during a period of one year. He will be assigned to compilation of a portion of the handbook for about six months and to completion of reports and papers on recreational use interpretations during the remainder.

At the previous ECSS committee meeting the secretary undertook to act as editor-in-chief and to develop a expanded outline of "A Soil Survey procedures handbook". The main chapter headings proposed, and a section of one of the chapters, is attached for discussion purposes.

Soil Survey Procedures for Canada

100 Soil Surveys in Canada

200 Planning for Soil Surveys

300 Managing Soil Survey Operations

400 Conducting Soil Surveys

500 Application of Soil Survey Information

600 Soil Survey Investigations

700 Information and Display Systems

405 Preparation for surveying

.1 Review work plan

.2 Review reference material

.3 Assemble equipment, materials

.4 Party leader fast field once-over trip

.5 Preliminary photo interpretation

.6 Prepare key to photographic recognition of major mapping units

.7 Compile preliminary map legend and description of map units

.8 Test map sample areas and conduct transects to test and revise preliminary legend major map units descriptions

.9 Revise and finalize mapping legend

.10 Compile estimates of daily mapping rate attainable

.11 Prepare revised work plan

(a) staff

(b) budget

(c) schedule

(d) supporting activities

.12 Prepare documentations for first field review

700 Information and Display Systems

701 Media used to inform the public

.1 Published soil Surveys

(a) Soil Survey monographs and maps

(b) Interim Soil Survey reports and maps

(c) Soil Survey Maps with expanded legends

(d) Exploratory soil survey reports and maps

.2 Popular Publications

.3 Newspapers and magazines

.4 Television and radio

.5 Displays in Public Places

.6 Soil Survey investigation reports

(a) presentations at learned societies

(b) contributions to referred journals

(c) contributions to other journals

.7 Interim and Annual reports

.8 Soil Handbooks

(a) Systems of Soil classification for Canada

(b) CanSIS manuals

(c) Soil mapping system for Canada

.9 Summaries of data stored in CanSIS

(a) Soil data file

(b) Soil cartographic file

(c) Soil management file

.10 Other maps

(a) Small scale maps

(1) Soil landscape maps

(2) Physiographic maps

(3) Climatic or agromet maps

(4) Capability maps of provinces

(5) Index to soil surveys

Soil Mapping System

K.W.G. Valentine

Progress 1979-81

The first draft of the Proposed Mapping System for Canada was printed and circulated in limited numbers during the summer of 1979. It took the form of a somewhat modified version of the report that was presented to the Expert Committee on Soil Survey in March 1979. Only limited field testing was possible in 1979 and so only minor revisions were proposed in 1980. These included a definition of an "observation" and recommendations for the definitions of stages and forms of legends.

The summer of 1980 offered the first chance of testing some of the proposals through a full field season. In the fall of 1980 the working group members collected opinions and recommendations from their regions. Then in January 1981 the group met for three days in Vancouver to work through a revision of the proposal. Only B. Kloosterman and G. Beke were unable to attend (J. Shields stood in for J. Nowland). The chairman is now preparing a full revision of the system which will be submitted to the secretary of the Expert Committee on Soil Survey by May 1981. It is proposed that a limited printing (about 300 copies) should again be made and circulated to those actively involved in soil survey. The system should then be used and tested for a few years. Much of what is proposed really needs to be incorporated right from the beginning of a project to evaluate it properly. Therefore, it will probably be best if the 1981 revision remains essentially unchanged for about three years. During that time it will have become obvious whether it can be formally published for adoption and general distribution, or whether some or all of it needs changing again.

Major changes in 1981 revision

During their January 1981 meeting the working group discussed the whole of the proposed revision. The major changes that will be proposed are listed below:

Survey Intensity Levels

The original table describing and defining survey intensity levels has been revised. The survey procedures that really differentiate the five levels are separated more clearly from such things as scale and purpose which are indirectly associated with survey intensity.

Working Group Members: C. Schryburt (Nfld), G. Beke (Maritimes-resigned Feb 1981), J-M. Cossette (Que), M. Langman (Ont), B. Kloosterman (Ottawa-CanSIS), J. Nowland (Ottawa, vice chairman), W. Fraser (Man), D. Acton (Sask), W. Pettapiece (Alta), E. Kenk (B.C.), and K. Valentine (B.C., Chairman), plus corresponding members P.H.T. Beckett (Oxford) and R.W. Arnold (Washington, D.C.).

Observations - Soil Individuals - Map Units - Delineations

The relationships between these four things is described. Some of them are concepts, some are real things. Some have geographical names, some do not. Some are taxonomically pure, others have inclusions. The original discussion used the terms pedon and polypedon. The dependence on these latter terms has been lessened in the 1981 revision. The role of our soil taxonomy in the description of soil individuals and map units is discussed as well.

Criteria for soil individuals and map units at different survey intensity levels

One of the requests that the working group received was to establish the class limits that were appropriate for mapping soils at different survey intensity levels. After some consideration it became obvious that such a recommendation is impossible when the range of characteristics of the soil population is different for each survey area. Moreover, the criteria and their class limits will also be modified according to different survey objectives.

However, the working group has developed a table with a list of recommended criteria, plus the number of classes of each criterion (but not the class limits) that might be appropriate at each survey intensity level. Thus in a level 4 survey a surveyor may only need three classes of slope to differentiate map units, whereas in a level 2 survey he may need six classes. What cannot be stipulated are the limits of these classes. For a level 4 survey in flat country the three classes may be 0-5%, 6-15%, and over 16%. In hilly country they might be 0-10%, 11-45%, and over 45%.

A definition of a map unit

A modified definition of a map unit has been proposed. This will mean that a map unit is the aggregate of all delineations that contain exactly the same symbol (taking into account both the numerator and denominator portions). This has the advantage that a map unit will now remain the same regardless of the form of the legend (closed, open, ajar! etc.). This was not so under the previous definition.

Legends

There will be a fuller discussion of legends, including stages and forms, working and publication legends and the advantages and disadvantages of the different types. No single form of published legend satisfies all the requirements of all conceivable projects. However, the controlled form is still recommended as having the greatest number of advantages.

Some formats for controlled legends will be recommended based on certain assumptions about intensity and purpose of the survey and the content of the report etc. In addition there will be a discussion of the principles behind designing a legend, so that alternative forms may be chosen to suit unusual projects.

Symbols

A standard method of creating symbols for published maps with controlled legends will be proposed. This includes the symbols for soil individuals, and for their soil and landscape phases.

The Future

The efforts of the working group over the last two years have been based on the premise that the immediate problem was to document the principles behind our present method of mapping soils, and to encourage some degree of standardization by recommending a best alternative where a number of methods were in use. The type of survey considered was the one which is done with a principal purpose in mind but which will also have to provide useful soil data for other land use decisions as well. The special purpose, or single purpose survey, was not considered. Similarly, it was assumed after some discussion that our soil taxonomy would continue to be used as an integral part of such a mapping system.

Perhaps now, while the 1981 revision stands for a year or two, is the time to consider whether our present system as a whole is really the best way of doing things. No one who has been exposed in any way to the deliberations of our working group can deny that soil maps are made in a very complicated way. The two prime sources of that complication are our insistence on creating repetitive units on the map (the element of synthesis in our mapping), and our use of the Canadian System of Soil Classification to describe and classify the soils that we map. Both these sacred cows have been questioned sporadically over the past two years, but they have stood their ground Is it now time for a fuller investigation of the possibility (and logic) of alternative methods in particular circumstances? Are there not some projects that could well be satisfied by uncorrelated maps where conditions within individual polygons are described via an open legend? Or, just because we have a system of soil classification does that mean we have to use it in every project?

The whole procedure of free survey could well be evaluated, along with the use of the computer to sort data from field observations and to create soil individuals and map units. Could CanSIS not be converted gradually from its admirable storage role at the end of the survey to a more manipulative role during the survey. Thus computer compatible field sheets could be used to feed in data via regional terminals to be sorted to create soil individuals and map units during the survey.

Lastly perhaps it's time we took a hard and pragmatic look at our budgets and the number of soil surveyors there are in Canada. Many soil survey techniques have been borrowed uncritically from the USDA Soil Conservation Service. We sometimes have trouble making them work in Canada. Perhaps instead of taxing ourselves harder so that they do work we should acknowledge that they are inappropriate for the mapping of an often less accessible area by far fewer people.

Canada Soil Information System

B. Kloosterman

Introduction

Increased soil data processing activity in Canada again necessitates establishment of a CanSIS working group. This group is being established to help guide CanSIS activity. A large group met during the ECSS meeting to determine the future of the group. To set the stage, present capability of the system was illustrated.

Cartographic Subsystem Capability

1. Interpretive maps through coding up turn around documents, gives acreages
2. Derivative maps through coding turn around document, acreages included
3. Display of isolated areas with unique features with acreages
4. Map display with combination of symbol, hectarage, acreage
5. Symbols reformatted for Alphatext input
6. Generation of color separation guides
7. Line and symbol scribes for original or interpretive maps
8. Turn around documents, editing, acreages, coding (Bilingual document)

Data Management Subsystem Capability

A DETAIL 2 File

1. Profile Descriptions, analytical methods in prose and tabular format
2. Summaries
3. Special request reports (Ottawa, Manitoba)

B Performance/Management File

1. Summary descriptions
2. Generation of interactive reports from most relations (Dream)
3. Generation of more complex reports using EASYTRIEVE

C Soil Names File

1. English reports sorting by province, nationally or by other features. French version available by summer 81

D Warden Files

1. Warden A/B summary report
2. Geographical plots of Warden observations
3. Bivariate tables
4. Histograms

E Ontario Daily

1. Profile description reports
2. Summaries
3. Most statistical manipulation interactively-means, standard deviations etc.

F Spactial Display Package

1. Plot any data in 4 colors
2. Convert most projection to cartesian

Terms of Reference

The following terms of reference were defined and approved by the group:

1. Provide a communication channel through which difficulties or problems caused as a result of involvement in CanSIS may be reported and course of action planned.
2. Identify and consider regional requirements for software, technical and capital support resulting from involvement in current and upcoming projects.
3. Assume advisory responsibility for developing, testing and sponsoring training seminars on collection, updating, manipulation and retrieval of data interactively.
4. Report annually the state of the art in geo-information activity in the natural resource and earth science disciplines on a regional basis.
5. Develop cooperatively a national and regional CanSIS user policy dealing with issues such as user access, data security, legal responsibility of data use and interpretation.
6. Coordinate development of regional CanSIS systems or nodes, including analysis and testing of core software developed by Ottawa and application software developed by the regions.
7. Establish a newsletter to communicate CanSIS activity.

Issues and Concerns

During the course of the meetings a number of items came to light that deserve serious consideration.

1. Computer Legends

Several groups from across Canada are ready to create computer legends with which to interrogate the Cartographic file. Guidelines will have to be established in order that sofware compatibility may be achieved.

2. Preliminary Map Digitizing

Concern was expressed that the Cartographic file was of little use to the surveyor developing his final map product. At present only final manuscripts are digitized. Acreages, mapping unit counts and distributions are no longer required because they were used at an earlier stage. It was suggested that the preliminary maps be accepted on a trial basis. The only variation would be that symbols would be sequential numbers which are latter tied into the actual mapping unit symbol.

3. Regional processing budgets

Since regional access to the system is just beginning therefore it was extremely difficult to assess regional needs. Tentatively, $2000/yr. will be allotted to each region for remote processing on Data Crown. This will be monitored since some regions will require less, others more.

Increasing demand for information necessitates interactive access to the DETAIL, SOIL NAMES, and DAILY files. The DETAIL file should be up in 1981-82 fiscal year. Ontario DAILY is already up, Atlantic DAILY up by April 15. SOIL NAMES will be up by June 1.

5. Data Security

Serious concern was expressed about access to data by unauthorized users. Quebec working group members will take a close look at user policy and data security. Ottawa will reassign accounts on the Computer by region so each will have greater control over its own data.

Regional Needs

1. Vegetation file

There seems to be an increasing need for a national vegetation file. Several regions are collecting very detailed vegetative data in cooperation with foresters and ecologists. Dave Moon and Keith Jones have agreed to come up with a proposal for a file.

2. Polygon Overlay

Although CanSIS is committed to establishing a digital link with the CGIS and thus make feasible using that system for polygon overlay, some members felt that this capability somehow be developed within CanSIS. A technological break through in this field may make this a possibility, with an off the shelf purchase of hardware and software.

3. Regional Interactive access

More regions are interested in accessing their information locally. To date, an anticipation of this need, terminals have been/will be placed in Guelph, Truro and Vancouver. Others will go into the regions as needs are identified and funds become available. Training sessions will be staged so that optional use of facilities will be realized.

4. Point in Polygon

Integration of map and attribute data is a preliminary concern. A contract will be let fiscal year 1981-82 to develop this software.

Recommendations

1. That the CanSIS working group be reestablished and that the necessary resources both p/y and financial be released to fulfil its function.
2. That the Working group be supported in making remote access to the CanSIS systems a reality for all regions by providing necessary training and demonstration programs to allow full exploitation of the system.
3. ECSS memberships cooperate with the working group in establishing goals, guidelines and policies that would facilitate data capture, management, retrieval and information dissemination.

Member Responsibility

The following are some of the tasks the working group members would be asked to be aware of:

1. Liaison person

The responsibility rests with the member to inform personnel on current CanSIS activity. This would include assuring that provincial data going into CanSIS has met standards of quality. He would also coordinate communication between his unit and CanSIS for all data input, updating and retrieval. This would help reduce response time from the system.

2. Dialogue

The group serve as a sounding board for new ideas, projects and tasks that affect the system as a whole. This will inform the groups of anticipated activity and assure that components are not developed in a vaccum.

3. Information Supplied

Each member would be on the lookout for any material that would be of interest to the others. Material would be forwarded to Ottawa and circulated from there.

4. Reviewer

Each member is requested to review manuals, papers and documents produced by the CanSIS working group.

5. Research

Each member will consider one of the issues important to the proper functioning of the system. These are outlined below.

Communication

The suggestion was forwarded that a newsletter be established to keep the regions informed. It was decided to circulate the minutes of the meetings of the cartographic and data management groups to the regional members. Any additional news sent in would be included as well. This could evolve into something somewhat more formal. The letters would be sent out on a 2-3 month basis.

Assigned tasks to members

As the use of CanSIS becomes more widespread, policies and guidelines will have to be developed to guide system use. An effort has been made to identify "mini-projects" that tie in with ongoing regional concerns. These assignments should involve more of a mental exercise then actual work. In most cases a definitive set of concise statements are looked for.

a) British Columbia

To define responsibilities of national CanSIS and regional units. Includes statements on compatibility of data sets between national and regional system and responsibilities of software development.

b) Alberta and Saskatchewan

To define the basic consistency checks for data entry into the DETAIL2 file. These will probably be done on an Order by Order basis The actual division of the work will be left up to the two working group members but familiarity with certain soils should be taken into account.

c) Manitoba

Establish recommendations for establishing a CanSIS node or system in the region. Will consider resources required, communication channels to be established, etc.

d) Ontario

Conceive and document a justification for developing in CanSIS an overlay capability. Since software of this sort encompass other capabilities, an evaluation of other map manipulation techniques should be explored at the same time.

e) Quebec

This region has a particular concern about the establishment of policies regarding security of data in the system and rights to its use.

f) Atlantic Provinces

Research the alternative methods of out putting interpretive maps and explore product applicability for various uses.

Other possible tasks (currently unassigned)

a) Criteria for data acceptance into national files
b) Cost recovery guidelines for external requests
c) Small project data capture: guidelines and procedures
d) Preliminary map guidelines - critical path
e) Conventions for output of tables, charts, summaries and descriptions for inclusion into soil survey reports
f) Evaluation criteria for accepting outside software
g) Computer legend creation criteria
h) CanSIS and word processing
i) Electronic data collection in the field

Some of the foregoing items will be developed by CanSIS staff but <u>all</u> need regional input.

TERRAIN SCIENCES DIVISION ACTIVITIES

R.J. Fulton, Geological Survey of Canada

Terrain Sciences Surficial Deposit Mapping

The objectives of the Terrain Sciences Division are: the provision of a comprehensive geological knowledge base on the surficial materials, geomorphic processes and natural terrain hazards of the Canadian landmass and on the capability of the terrain to support human activities. These objectives are approached through two operational components, regional terrain geology and applied terrain geology. The regional component is made up of systematic mapping, compilation and synthesis and paleontology, paleoecology and geochronology. The applied component consists of engineering geology and geomorphic processes and terrain geochemistry.

Systematic Mapping

The main goal of systematic mapping is to provide map data that can be used to portray a general understanding of terrain materials and features. The operative words used to describe our project objectives are: map, describe and explain. The scale of field work and of the larger scale maps produced is not standard but is adjusted to take into account the likely use of the data, the complexity of and the importance of local scientific problems, the resources available and logistical considerations. In most areas our work is done at a scale of 1:100 000 or 1:125 000 with the normal scale map that reaches publication generally being 1:250 000. However some work is published at 1:50 000. The prime concern is not to have coverage at consistent scales but to obtain information that will permit us to meet our major long-term objectives of producing Quaternary geology maps of all of Canada at a scale of 1:500 000 and to obtain an understanding of the Quaternary geology.

We are not the only organization in Canada doing this type of work. Several provinces have Quaternary geology or terrain groups but there is great variation from one province to the next in the size, quality and interests of the provincial groups. In general their work is oriented towards specific interests or problems (such as sand and gravel resources) with no attempt made to provide a systematic Quaternary geology-terrain data base for the entire province. In addition to units connected with geological organizations, groups doing surficial materials and terrain typing are found in departments of Environment, Soil Survey groups, Highways departments and other organizations that require surficial materials information. All of these groups obtain information that we find most useful and that can be incorporated into our work. However, almost without exception they collect only information to answer their own needs and do not present data related to the fourth dimension, time, which is so important in understanding materials distribution and in projecting information.

Provincial Coverage

British Columbia: Quaternary geology-terrain maps and data are available for most of the densely populated areas of British Columbia. The British Columbia Soil Survey and now the Department of the Environment, have for a number of years been involved in inventory type work and have produced much usable terrain information. We have carried out several studies related to the Quaternary geology framework in separated areas, but a great deal of fundamental surficial geology mapping and data collection must still be done. At the moment we are carrying out several compilation activities and studies oriented towards Quaternary geology and this year are starting a project in the Central Interior. This new work will be oriented towards determining the Quaternary geology and landscape evolution of the area and will include compilation of surficial geology information at a scale of 1:500 000.

Alberta: In Alberta there is almost complete Quaternary coverage of areas south of the boreal forest at a scale of 1:250 000. At the moment Alberta Research Council has the most active Quaternary geology group of any province and they plan on completing coverage and compiling terrain and Quaternary geology information in the south. We have conducted Quaternary geology studies oriented towards learning more about the Quaternary history of present and buried valleys in the southern part of the province for many years. This work continues. Terrain coverage for the northern part of the province is inadequate. However, work by the Alberta Research Council connected with tar sands and heavy oil development has filled in some of this area and they will be expanding this work in the future.

Saskatchewan: Saskatchewan has good coverage of surficial geology and terrain information. The Saskatchewan Research Council produced maps for much of the province south of the treeline during the last two decades and at the moment are filling remaining gaps. Recently they gathered data for all of the northern part of the province and will shortly begin releasing maps at a scale of 1:250 000 for that area. We hope, in the near future, to begin an update of the Quaternary geology information in the southern part of the province in line with our objective of producing 1:500 000 compilation maps.

Manitoba: Almost complete coverage of surficial geology and terrain information is available for the southern part of the province and there is relatively complete coverage in the north. The province has several surficial geology workers who are mainly involved in detailed work for regional planning boards and aggregate delineation. We have no immediate plans for further work in Manitoba.

Ontario: Southern Ontario has the best surficial geology and terrain coverage of any part of Canada. Much of the work has been done by the Ontario Geological Survey at a scale of 1:50 000. Currently they are extending this work into the clay belt and regional development areas in other parts of the province. The Ontario Remote Sensing Centre has just completed a reconnaissance survey of the northern part of the province. They will produce terrain-type maps at a scale of 1:500 000 in the near future. There is not enough Quaternary geological control on these to satisfy our purposes but they supply a good first approximation of the nature of surface materials. The Ontario Geological Survey has contracted out terrain typing (largely airphoto interpretation) of the area lying between the northern Ontario work and their southern work. This is at a scale of 1:100 000 with an engineering bias but as was the case with the northern Ontario work, this provides a good first approximation of surface materials.

Quebec: There is a fairly good coverage of surficial geology and terrain information for southern Quebec. There are large parts of northern Quebec for which no data are available but the James Bay work of the Lands Directorate provides terrain data for approximately 410 000 square kilometres at a scale of 1:125 000. Over the past 4 years the Geological Survey of Canada has been conducting inventory work in western Quebec near Lake Temiskaming at a scale of 1:100 000. This work will continue. In addition we have begun a 1:500 000 scale compilation in the southwestern corner of the province.

New Brunswick: In the next year or two, surficial geology maps should be available for all of New Brunswick. We covered the southwest corner of the province some years ago and over the past four years, the Geological Survey of Canada has completed field work in the northern part of the province. Over the past two years New Brunswick has used money from a federal development grant to have a contractor cover the rest of the province. The province does some surficial geology related work but almost all of this is tied to aggregate resource studies. We have no plans to conduct further work but would like in the near future to compile a 1:500 000 scale Quaternary geology map of the province.

Prince Edward Island: Vic Prest completed mapping of Prince Edward Island at a scale of 1 inch to 2 miles several years ago. No further work is planned.

Nova Scotia: We have done considerable work on Cape Breton Island and this should be published in a few years. We have done little other mapping in the province but have gained a fair knowledge of the surficial geology and terrain of the province through work on Quaternary geology problems and compilation of parent materials information from soils maps. We would like to produce a 1:500 000 scale Quaternary geology map of the province but have no fixed deadlines.

Newfoundland and Labrador: We have done a fair amount of work in Newfoundland and Labrador but most of our information has not gone beyond the stage of Open File release. Maps at a scale of 1:250 000, for southern Labrador should be printed over the next year and in three years we should have completed field work on the island. This will place us in a position to compile a final 1:500 000 scale Quaternary geology map of the island.

Yukon Territories: We have expanded our work in the Yukon Territories in response to requests for information from the Yukon Territorial Government and Indian and Northern Affairs. They are currently in the throes of managing a development agreement for the southern part of the territory. At the moment we have surficial geology and terrain information for about half of the area south of 64° and plan on covering several more 1:250 000 NTS map sheets this coming summer. We plan on continuing to push work in the Yukon for the next few years.

District of Mackenzie: We have not conducted surficial geology mapping in the District of Mackenzie since the push during the early seventies to cover the Mackenzie Valley Corridor. Data for the southern part of the Mackenzie Valley are presently being published but the rest of the information is still only available on Open File. We plan over the next few years to update and publish the information for the northern part of the valley.

District of Keewatin: As was the case in the District of Mackenzie, the District of Keewatin work was related to specific requests for information related to pipeline construction. We have not done any extensive work in the area since assessing the environmental impact of the Polargas Pipeline. Most of the data collected during this work is only available on Open File but we hope to publish it over the next few years.

District of Franklin: In the District of Franklin we have covered Banks Island and most of the areas that either lay along proposed pipeline routes or that are in areas of oil and gas exploration. This year, we are starting a three-year project aimed at covering the western half of Victoria Island.

Compilation and Synthesis

In outlining the systematic mapping of surficial materials, mention was made of compilation of Quaternary geology maps at a scale of 1:500 000. One of our objectives is to prepare country-wide coverage at this scale and to accompany these maps with text information outlining the Quaternary history. This compilation is based on our systematic mapping and consequently cannot be completed until we finish this phase of our work (the year 2000?)

In addition, we are committed to producing a surficial materials map of Canada, at a scale of 1:5 000 000, by 1988. This map will be a companion to the Glacial Map of Canada. In areas of Southern Canada where surficial geology information is not available, we will use soils information. In the north above treeline, where neither surficial geology or soils information is available, we intend to use automated classification of LANDSAT Imagery. The most difficult areas will undoubtedly be the boreal forest region and forested areas of British Columbia.

Engineering Geology and Geomorphic Processes

The goal of this group is to obtain information on physical and engineering characteristics of surface materials and to obtain an understanding of the distribution, nature and rates of geomorphic processes. Terrain Sciences' contact with the Radioactive Waste Management Program is through this unit.

This component of Terrain Sciences Division at the moment is involved with studies of movement of surface materials on slopes, of frost heave and the effects of vehicle operation on terrain disturbance in the Arctic, with changes in stream channel and flow characteristics in the Mackenzie Valley and characteristics of certain types of slope failures and the resulting deposits in the Cordillera.

Terrain Geochemistry

The objectives of Terrain Geochemistry are to determine the general composition of surface materials and to obtain an understanding of the processes which cause this composition to vary from place to place and to change through time. There are two main elements to this work. The one attempts to use material composition as a key to understanding geological processes and as a tracer for locating ore deposits. The other element is oriented towards learning more about the location and source of harmful elements within Quaternary materials and with determining the characteristics of terrain that are important with respect to acid rain.

Drift prospecting has in the past been the mainstay of this activity but acid rain related studies have become a prime component in the past two years. The Geological Survey of Canada has used its knowledge of the distribution and composition of bedrock and surface materials to compile small scale maps showing the susceptibility of Eastern Canada to acid rain. In addition, a sampling project was started in the area between Kingston and Algonquin Park to learn more about the variation of carbonate content of surface materials. Prime objectives of this work are to learn more about the natural variations of buffering capacities of surface sediments and to determine the natural variations of trace elements that might be mobilized by acid rain.

Present Concerns and Thrusts

Manpower

At the moment our staff age distribution is bimodal with a distinct lack of mid-career workers. This is affecting our productivity and the type of work we can undertake because mid-career workers (10 to 20 years of experience) are the most productive, are willing and capable of tackling any job and provide inspiration and stimulation to younger workers. Also it is the mid-career workers who become the scientific managers and consequently there is a problem in finding enough managers to organize our work units in the most efficient manner.

Legends

Over the past year we have once again gone through a period of soul-searching concerning our legends. We have in the past been very liberal in what we permitted on our maps. This laissez-faire approach arose from the premise that each part of the country was different so that uniform mapping and legend systems were not appropriate. It was argued that the field worker knew how to best describe the surficial geology of his area. It became apparent that under this relaxed approach there would soon be as many systems and legends as mappers and that much of the variation was due to the training, personality and experience differences of the workers and not to regional differences in geology. We have proposed a standard, closed, system in which all parts of the area must be fitted into a relatively limited number of map units. Some local deviation is permitted and overlay patterns and spot symbols can be used to establish subunits.

Problems that remain but which have not been addressed are: accuracy and reliability of mapping and codification of methodology and criteria for establishing map units.

Data Handling

The Soil Survey Group is far ahead of us in the storage and manipulation of data. Personally I feel that we could use many aspects of the CanSIS system. To date, however, much of our effort has been devoted to reporting on individual map areas and there has been little use made of data beyond the production of single area maps and reports. Our philosophy has been that storage of data for its own sake is not a practical approach. Consequently, we will put off designing a data storage system until we have a better idea of what concrete use will be made of the data.

LANDSAT

Over the past year we have attempted to evaluate LANDSAT Imagery as an aid to our mapping program. We can now produce a supervised LANDSAT classification that can be interpreted in terms of already mapped surficial geology features. The next step of making use of a LANDSAT classification in an area where we do not already have a surficial materials map has not been taken but hopefully will be pursued in the near future. In addition, we plan on using LANDSAT data in producing a 1:5 000 000 surficial materials map of Canada

Relationships of Terrain Sciences and Soil Survey

In our view the Soil Survey produces maps which delineate uniform pedologic units. The accompanying text presents descriptions of the units, explanations of their characteristics and interpretations of their uses. Our maps, on the other hand, depict the texture and geologic nature of surface materials. The text which accompanies the surface materials maps presents a description of the materials, an explanation of their characteristics and a description of the events that led to development of the surficial materials and present surface forms.

Neither group is completely handicapped by not having the work of the other but the work of each is made easier if the other discipline has covered an area first. If we have a previous soils map, we do not have to spend as much time tracing out textural units and instead concentrate on problem map units and on gathering data related to geologic history. If the soil surveyor has one of our maps he does not have to spend as much time determining the gross configuration of parent material units but instead can concentrate on delineating textural variations within these major units and on problems related to soil variation on single parent materials.

Summary

My personal feeling is that because of the complementary nature of our work, we should be cooperating with the Soil Survey whenever and wherever possible. This seems to rarely occur because in general the areas of immediate Soil Survey priority are southern and accessible whereas our current priorities tend to be northern and in less accessible areas. A general understanding of the complementary nature of our work at higher levels in our organizations is unlikely because our two departments view their mandates as serving different groups. What has so far been the most successful way to work together has been keeping aware of each other's program and encouraging project leaders to collaborate when they are seen to have mutual interests.

The Role of Government in the North:
Natural Resources and Land Use Planning

J.I. Sneddon

The Role of the Department of Indian Affairs and Northern Development (DIAND) in the North

Under the Department of Indian Affairs and Northern Development Act, the Minister of DIAND is charged:

a) with responsibility for the control management and administration of almost all (98 percent) public lands in the North, that is, save these lands that have been transferred to the governments of the Yukon and Northwest Territories, mainly around the communities, and National Parks and Wildlife Preserves transferred under the National Parks Act and Canada Wildlife Act respectively); and

b) with the coordination of federal activities in the Yukon and Northwest Territories.

The Role of the Governments of the Yukon and Northwest Territories

The mandates of both governments are detailed respectively in the Yukon Act and Northwest Territories Act. Although the two territories differ in many respects, both basically are administered in the same manner, however the scope of these governments is not as wide as that of provincial governments. They have active roles in social and economic affairs, public works, local government and wildlife management. The federal government retains control over most territorial natural resources.

The Role of Other Federal Departments in the North

Although DIAND is the lead agency in the North, responsible for the coordination of federal activities, other federal departments play important roles in many areas relating to the North and to its environment, resource management, economic development and to the provision of services. Some of these departments include:

Agriculture,
Environment,
Energy Mines and Resources,
Fisheries and Oceans,
Regional and Economic Expansion,
Health and Welfare,
Public Works and
Transport.

DIAND Goals in the North

The goals of DIAND in the North may be categorized as providing the appropriate mechanisms and support to ensure that:

1. Northerners have the same rights and privileges of self-government as other Canadians;

2. social conditions are improved, and the vitality of indigenous northern culture is maintained;

3. the economic base is broadened and strengthened;

4. the aesthetic qualities, socio-economic values and the ecological vitality of the northern environment is maintained to acceptable standards; and

5. a balance is struck between conservation and development of northern natural resources for the benefit of current and future generations.

Activities Related to Natural Resources

In the non-renewable sector, activities are focused on developing and implementing both an energy policy and a mineral policy for the North. These are based in providing current and forecast assessments of potential oil, gas and other mineral resource reserves, and analyzing current and predicted demand in the North (e.g. for oil/gas/coal as a thermal-electric power supply for industry and community developments), South and markets elsewhere. Integral to developing and implementing these policies is the preparation, in cooperation with the territorial governments, of a framework for regional economic development, with possible time frames for related commercial developments, and predicted concomitant infrastructure requirements (roads, airstrips and marine transportation).

In the case of renewable resources, a major activity, and one on which any regional economic development is based, is developing and putting in place a land use planning regime for all of the North. Other important involvements include establishing a northern forest management regime and review and assessment of water management policies.

All activities involving northern natural resources are founded in environmental and resource management regimes directed to achieving their maximum long term usage and value to northerners.

Effective implementation of any policy is dependent on an adequate information base. Information is required to develop various infrastructure scenarios associated with possible developments; to enable up-to-date assessments to be made of the various northern industries, especially oil and gas and minerals; and to determine the environmental implications of various proposed developments. Socio-economic information is an important component of the total information base taken into account in the development of projects in the north. Baseline studies that have been launched in the past include; the soil surveys and land evaluations, in parts of the Yukon and Northwest Territories, that were completed by the Saskatchewan Institute of Pedology through the Land Resource Research Institute, Agriculture Canada, in 1977 and the Land Use Information Map Series, an ongoing program since 1972, being produced by the Lands Directorate, Environment Canada.

Although many studies are conducted in the North by individual federal departments (e.g. geological mapping by the Geological Survey of Canada, Department of Energy Mines and Resources) the majority of studies conducted are cooperative ventures between various federal departments the territorial governments and often provincial governments (e.g. the Mackenzie and Yukon River basin studies to gather information on water and related resources). In addition to the foregoing other studies are conducted which have international significance and relate to topics such as the Porcupine caribou herd, migratory birds and the International Biological Program. Because of their nature, studies in the North are often conducted under contract to consultants.

In many respects, data are only as valuable as they are accessible as information. Consequently, significant efforts are being made to coordinate data gathering and to eliminate overlapping, and to assemble and make it available in a format which adequately meets the needs of the diverse user groups.

Regional Planning in the North

Awareness of the need for comprehensive land use planning and management in the North has been highlighted in recent years by the Berger Report (1977), the recommendations of the Canadian Arctic Resources Committee, Second National Workshop (1978), and the Report of the Northern Mineral Advisory Committee (1979).

Although planning and associated activities have been undertaken for some time in the North (e.g. resource inventory program and Yukon resources information system study, components of the Canada - Yukon General Development Agreement and the Lancaster Sound Regional assessment), they have tended to be independent activities and not formed part of a comprehensive plan for the North.

In light of the above, the Northern Program of DIAND has initiated the development of a comprehensive land use planning and management policy for the North. Due to the magnitude of the area involved (4,860 million square kilometres, 40% of Canada's land mass), and also to budgetary constraints, current perception is to:

1. determine and priorize planning areas and establish planning goals for each;

2. analyse the data base for each area and acquire additional data to meet specific objectives where necessary;

3. prepare alternative resources management plans for each planning area; and

4. ensure that public participation is involved in the development and choice of the final plan before implementation.

The policy should enable DIAND in collaboration with other federal departments and the two territorial governments to systematize land use planning in the North. This will enable DIAND to better manage land and help resolve the increasing and often conflicting demands placed upon it.

Much has been achieved by the Federal and Territorial Governments in the past, through their various agencies with legislative authority in the North. Valuable working relationships have been established between these agencies and many working agreements have been successfully completed. A northern land use planning policy should provide these agencies with an opportunity to coordinate and focus their activities and allow them to participate in the planning process as their mandates dictate.

REPORTS BY ECSS MEMBERS

Alberta

J.D. Lindsay

In Alberta, five main program components have been identified. These include Inventory and Correlation, Climate and Water, Land Evaluation and Land Use (Interpretations) Information Systems, and Soil Quality and Degradation Problems.

Inventory and Correlation.

The objective for Inventory and Correlation in Alberta is the same as reported in 1980, that is a soil survey up-date of approximately 8 million hectares in central and southern Alberta. Priority areas identified for this work include the Calgary-Edmonton corridor, potentially irrigable areas and urban areas. For most of these studies, a map scale of 1:50,000 has been adopted. The present effort amounts to about 8 person years annually.

The location of the presently active soil projects is shown in Figure 1. The status of the various projects is as follows:

PROJECT	STAGE	SCALE	COMPLETION DATE
County Warner #5	Field work 4/5 completed	1:50,000	1982-83
County Beaver #9	Field work 2/3 completed	1:50,000	1983-84
Calgary Area	Field work completed, map and report compilation underway	1:50,000	1982-83
Provincial Parks	Field work completed in Carson Lake and Laurier-Whitney Lakes areas. Guidebook to interpretations published	1:20,000	continuing
Oil Sands Area	Field work completed, map and report compilation underway	1:126,720	1981
Wapiti Map Area	at printer	1:126,720	1981
Iosegun Map Area	at editing	1:126,720	1982
Two Hills County	inactive	1:30,000	
Newall County	at editing	1:63,000	1982
Brazeau Dam Area	at printer	1:126,720	1981

PROJECT	STAGE	SCALE	COMPLETION DATE
NE Lethbridge (82H)	map only at printer	1:126,720	1981
Banff-Jasper (National Parks)	report and map compilation underway	1:50,000	1981
Solonetzic Soil Map	at cartography	1:1,000,000	1981

In 1981-82, a new initiative will be a soil survey in the County of Paintearth # 18 in south-central Alberta. This project will be a level 3 soil survey, at a scale of 1:50,000. Alberta Agriculture was the requesting agency and special attention will be given to the relationship between Solonetzic soils and the deep plowing experiments that have been conducted in the County over the past five years.

Climate and Water.

The objective of this component is to provide information for new land development and land evaluation interpretations. Neutron probe access tubes and temperature sensors have been put in place at several sites, in areas where soil survey programs are active. These include the Counties of Beaver and Warner, the Calgary and Drumheller areas, and in the Rocky Mountains. In the future, soil temperature and moisture monitoring sites will be established in all new soil survey project areas.

Land Evaluation (Interpretation).

A study of the relationship between crop yields and soil and climatic parameters is continuing. This study relates cereal crop yields to the Canada Land Inventory system, using a hail and crop insurance data base. At present, a report summarizing the 1965 to 1974 data is being prepared. One conclusion indicates yields are closely related to Agroclimatic zones, but that there is a strong yield gradient from north to south within any one zone. Also, there is a predictable overall relationship between yield and CLI classes, but there is a great deal of variation between the effects of various subclass limitations. It appears that if more specificity is desired, then the climatic factor in particular must be refined. It is recommended that the study be continued to broaden the data base, which will provide a sound footing for yield predictions.

In 1980, the program of acquiring data in the field and in the laboratory, relative to some physical properties of soil mapping units was continued. During the field season, sites in the Peace River, Calgary, Edmonton and County of Beaver areas were investigated. Such data will be used to develop water supplying criteria and aridity indices, as well as for non-agronomic interpretations, such as septic tank disposal fields.

A guidebook has been compiled outlining the methodology used for arriving at soil survey interpretations for parks and recreational uses in Alberta. This report describes the important soil characteristics such as permeability, texture, reaction, salinity, and structure and relates them to recreational use of soils. Guidelines are provided for a number of uses, including camping areas, playgrounds, picnic areas, paths and trails, etc.

Information Systems.

The main objective of this component, is to publish soil survey reports and maps of the up-dated surveys. The acquisition of a VT100 terminal has permitted the introduction of word processing methods, such as Textform, for report compilation. It is believed that this approach will provide a more efficient means of compiling reports, with a saving in time and expense.

Consideration is also being given to the development of a data management system for Alberta soils.

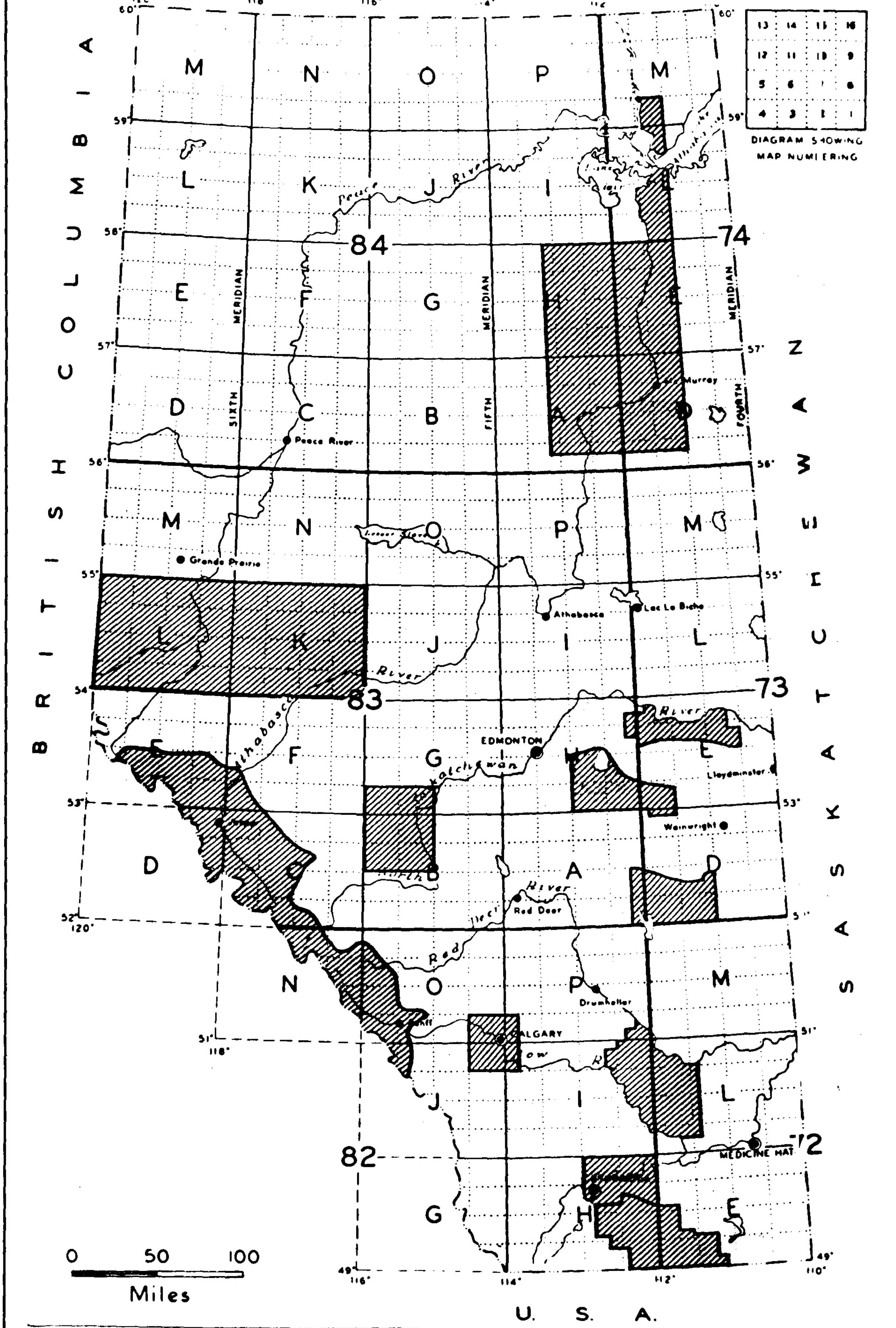
Soil Quality and Degradation.

The objective of this component is to develop soil quality criteria for disturbed and undisturbed soils. In 1980, a report was compiled by a number of soil scientists in the province, outlining guidelines for the reclamation of disturbed land. Techniques and criteria for soil mapping of pre and post-development areas are outlined. As well, the types and methods of laboratory analysis required to characterize the undisturbed and disturbed soil at developmental sites are outlined. Criteria are presented indicating the quality and quantity of soil required to ensure successful reclamation of disturbed land.

The possible affect of SO_2 impingement on increased soil acidity is being investigated at the present time. Two reports were prepared in 1980, dealing with this subject. The first dealt with the soils of the Sand River area, in which the various soil mapping units were rated as having low, moderate, or high sensitivity to acidification from SO_2 impingement. The criteria used to establish the sensitivity classes were based on buffering capacity as it relates to soil texture, organic matter content and cation exchange capacity.

As a follow-up, a second project dealt with the sensitivity of the soils in northern Alberta and northern Saskatchewan. This project was carried out in co-operation with the Saskatchewan Institute of Pedology, and rated the soils of the area in a manner similar to that used in the Sand River area. A relatively small scale map (1:2,000,000) was produced showing the location of the various sensitivity classes as determined from the soil distribution in the area.

The reclamation studies in the foothills area continued in 1980. Specifically, two studies are in progress, the first is concerned with the revegetation of disturbed areas where the limiting factors are primarily steep slopes, and a minimal supply of soil for reclamation purposes. The second project is related to the potential for re-vegetation of fly ash, which is produced in fairly large quantities in the area.



BRITISH COLUMBIA
SASKATCHEWAN
U. S. A.
84
74
83
73
82
72
SIXTH MERIDIAN
FIFTH MERIDIAN
FOURTH MERIDIAN
Peace River
Grande Prairie
Athabasca
Lac La Biche
EDMONTON
Lloydminster
Wainwright
Red Deer
Drumheller
CALGARY
Banff
MEDICINE HAT
Ft. Murray
Saskatchewan
Red Deer River
Bow R.
Athabasca
DIAGRAM SHOWING MAP NUMBERING
0 50 100
Miles

British Columbia

T.M. Lord

In 1979, the British Columbia representative to the first meeting of this Expert Committee gave a clear statement on provincial land resource research needs. A year later we followed up with a report that identified the main priority areas within the framework established by the land resources report of Halstead and Clark. Program needs in each of three high priority agricultural areas - southwestern coastal zone, the rangelands, and interior wetlands - were set out in a position paper to the Canada Committee in 1979, and reviewed here in 1980.

Projects undertaken by the Terrestrial Studies Branch were extremely varied and included mapping of soils, terrain, agricultural capability, forest capability, geologic hazard, soil erosion and urban suitability in many areas of the province.

Two major soil reports completed last year were Soil Survey of the Pemberton Valley and Soil Resources of the Lardeau Map Area. Other mapping projects scheduled for completion in 1981-82 are: South Okanagan, Seymour Arms, Nelson, East Kootenay, Fort Simpson Trail, Quesnel, Barkerville and Horsefly.

Last year, provincial teams of soil surveyors completed 75-80% of a field work goal to survey 40 000 ha per year in a 6-year detailed soil survey program on Vancouver Island. Soil names and working legends were correlated with a similar 1:20K scale Federal survey of the Gulf Islands. Preliminary soil maps and agricultural capability maps were completed for the Agricultural Land Commission and the Gulf Islands Trust. Soil surveyors are currently working on the final draft of a manual which will revise classes for agricultural capability, with particular application to detailed surveying.

Closely allied to the foregoing is the Fraser Valley Soil Survey. This product of the Terrain Studies Branch of the British Columbia Ministry of Environment will consist of 6 volumes comprising 1:25K scale detail soil maps of the delta and floodplain, 1:50K scale maps of adjoining mountainous and coastal lands, soil descriptions and technical profile data, agricultural interpretations, and non agronomic interpretations for engineering, forestry and recreation. Detail maps are at the printers, and other volumes are ready for printing or in late draft stage. The Department of Soil Science, U.B.C., is studying the variability and productivity of soil management units of valley soils.

The B.C. Ministry of Agriculture and Food allots 2 person years to appeals (mainly exclusions) to the Agricultural Land Commission. In 1980 this involved 45 on-site inspections and reports concerning soils, capabilities and land use. The Ministry also conducts area reviews where information on soils and agricultural capability is insufficient or lacking. Soil surveyors are also involved in fine tuning programs concerned with grazing and forage-producing lands in the rangeland and central interior areas.

Rangelands of the Interior Plateau carry a high priority rating. Although much of the area is forested, it includes large tracts of grasslands. Practically all of these lands, which contain from 4 to 7% wetlands (Organics and Gleysols), are controlled and managed by the Ministry of Forests. Vegetation studies and research on climate remain as the primary needs on the dryland ranges. Apart from research conducted by Kamloops Range Research Station on fertility, management, and extent of wetlands, hard base data are lacking. To meet the needs for intensified forage production and the increasing competition for use of wetlands by other users such as wildlife, recreation, forestry and hydrology, staffs of provincial, federal and university agencies are collecting and assessing data on soils, vegetation and hydrology. Computer analyses of soil and vegetation plot data on selected transects are showing significant correlation of vegetation community types with such soil and terrain parameters as depth to mineral soil, microtopography, thickness of surface organic horizons, decomposition of the surface and depth to carbonates.

Although provincial and university staff members are conducting studies to establish climate-crop relationships and water use by trees on summer drought areas of Vancouver Island, there is an urgent need in the province for climatic information in many fields. Some concerns of surveyors and research workers are: that soil temperature classes are not realistic in forested soils, that the climatic index is too broadly based and that we have little to no information on climate in the subalpine zones. The province has put in a strong request for a federal climatologist. John Nowland's cross country tour, supplemented by catchy SWIG, SWIMM and SCHWABS proposals, has stirred up an enthusiastic audience in B.C.

We in British Columbia are very concerned with soil information systems and data quality. In 1980 the province published a manual for describing ecosystems in the field. The authors and editors are pedologists, ecologists, foresters, and biologists in the provincial, federal and private sectors. The purpose of the manual and the field data forms is to standardize approaches and definitions for ecological data collection. The manual and the forms are for use by all resource people working in the province. Much of the data will be stored in computer files. At this point we must again raise the question of compatibility and worth of federal and provincial files. Perhaps the recent memo "Reactivation of the CanSIS Working Group" and the workshop at this ECSS meeting will provide some answers.

Land deterioration and resource protections are listed as priority items for the Research Branch in the 1977 R and D program of Agriculture Canada. In response to this priority the Vancouver Research Station initiated in 1979 a study to evaluate soil erosion in Peace River cropping systems. This project, involving Beaverlodge Research Station, the Department of Soil Science U.B.C., and Northern Lights College has received strong support from local agricultural organizations. Instrumented plots measure soil losses and sample runoff water on three crop replicated treatments. With the growing concern over problems of soil deterioration and loss it is hoped that this program will be continued as a priority item in the Peace River land evaluation area.

SUMMARY

We would seem to be losing the avenues of communication that a short while ago existed between agencies and individuals. Perhaps this is due in part to reorganization changes within resource ministries in response to changing inventory priorities. An important contributing factor must be the rapid technological advances in information systems, data banks, autocartography, etc.

In any case, I find it it more and more difficult to meet with, or collect together, the right people to contribute to a regional report such as the one presented here. In British Columbia we do not have an Institute of Pedology, although Les Laukulich, Head of the Department of Soil Science, U.B.C. has in place the nucleus of such a body under a Centre for Land Resource Science. Until such time as an institute or its equivalent is formed, the pro-tem chairman of a subcommittee of the Soil Science Lead Committee is the official representative for the province. We held our last meeting less than two weeks ago. Although all agencies concerned with soil research and the use of soil information were not present, I hope to have conveyed the kinds of tasks we do and the problems that concern us.

The members of the B.C. Soil Survey Subcommittee reviewed the guidelines and terms of references for working groups at the ECSS meetings. The views of the members are incorporated in this report or will be conveyed to the various working groups.

The topic "Soil Survey Data Quality" under the Soil Correlation working group elicited a strong response from all members of the subcommittee. Our concerns may be grouped under two categories: (1) The need for maintaining standards and quality control of soils data collected in the field, analysed in the lab, and stored in computer banks. We now have, or are developing, standardized approaches and definitions for data collection and field mapping in publications such as the CanSIS and B.C. field description manuals, and A Soil Mapping System for Canada. However, the number and diversity of agencies presently collecting soils and ecological data are rapidly outstripping the complement of trained, experienced professionals available as project leaders, correlators and party chiefs. This concern leads into the second part of the topic: (2) Where do our future soil surveyors come from and how do we train them? During the so-called "good old days" of the CLI and standard type surveys, soil survey agencies, generally supplemented by university staff, trained students under the apprenticeship system. Today in B.C. the federal unit is limited to two summer students (as it was 30 years ago) and the provincial survey agency must share student time with other resource sectors or find special funding. The universities lack funds and staff to support practical field training camps as part of their curricula. We therefore face a Catch 22 situation - the universities turn out soils graduates who lack practical field training while the survey agencies are forced to hire people with some survey experience. Trained soil surveyors face strong pressures to leave for higher paying jobs with consultant firms, private industry - particularly forestry companies, and other government agencies such as: the Ministry of Forests, the Land Commission, B.C. Hydro, and regional planning boards.

We have really only touched on the topic of soil survey data quality. Perhaps this important subject should be considered as the main theme for a workshop in the near future.

Manitoba

R.E. Smith

Manitoba's position with respect to programs and services requirements related to land resource research as outlined in the 1980 regional report by R.E. Smith remains basically unchanged.

The research priorities in Manitoba, as it has for many years reflects the need to continue a strong program of inventory to assess deteriorating agricultural land quality; to resolve rural-urban land use allocation problems in the agricultural sector of the province; to identify climatic requirements of important value-added crops; to study the impact of soil losses by water erosion, the decline of organic matter in soils and changing salinization as a result of cultivation; to develop computer-based systems of land evaluations; and to continue a research program to improve fertilizer recommendations for the economically important crops in the province.

More specific information with respect to these research concerns can be found in the minutes of the 1980 second annual meeting of the Expert Committee on Soil Survey.

Current Issues and Concerns

1. Additional Land for Agricultural Production

The Provincial department of agriculture has within the last year, become interested in determining the potential for additional land for crop production, particularly in the northern regions of the province where little or no soil survey information is presently available. A recently completed crude study of the soils and climate of the area suggests that the current base of 5.2 million ha. of improved soils for crop production in Manitoba can be increased approximately 3 or 4 million ha. and that approximately one-third of this potential lies in the northern portion of Glacial Lake Agassiz near Thompson, Manitoba. Considerable pressure from the Provincial Crown Lands Branch of M.D.A. is mounting for an accelerated soil survey of this northern clay belt region.

2. Drought Proofing

"Drought proofing" have become new buzz words in the province. To politicians it means subsidies to farmers who have suffered severe crop losses as the result of insufficient rain to grow crops. To technologists in MDA and the Water Resources Branch of the Department of Natural Resources it means responding to increased farmer requests for information on irrigation technology. The impact of the recent drought in Manitoba has been significant. The provincial acreage currently under irrigation has increased from 1500 in 1975 to 25,000 acres in 1980, a more than ten-fold increase in that time.

This situation has also had an impact on the Survey program in that requests for soil suitability for irrigation information have also increased significantly. The problem is two-fold, much of the area in the province where these requests originate do not have detailed, updated soils information and secondly current available guidelines for assessing soil suitability for irrigation do not take into account improvements in the application of water by huge center-pivot irrigation systems. The pressure on survey to provide spot investigations and to become involved in extending irrigation information at public meetings of producers and agronomists has increased very significantly.

New Brunswick

H.W. Rees

The Federal, or Agriculture Canada, Soil Survey Unit activities consisted primarily of work concerned with ongoing soil resource inventories as follows: a) Detailed Soil Survey of the Sussex Area (scale 1:20,000); b) Reconnaissance Soil Survey of the Chipman-Minto-Harcourt Area (scale 1:50,000); and c) Exploratory Soil Survey of Central and Northern New Brunswick (scale 1:250,000). In addition, several other projects were undertaken. A soil moisture/temperature regime monitoring site was established in cooperation with the Hydrology Section of the Fredericton Research Station to develop instrumentation for future monitoring of representative New Brunswick soils. Support was provided for a soil erosion study headed by Dr. Chang Wang, of LRRI, Ottawa, in which the transect approach was used to quantify changes in soil properties as a result of erosion. Initial preparations were made for an Organic Soils Mapping Workshop scheduled for Fredericton, N.B., in mid-September, 1981.

The Provincial, or N.B. Dept. of Agriculture Soil Survey Unit, was primarily involved with the application of existing soil survey information (its use and interpretation) and the investigation of soil related problems--soil inventory involvement being limited to the completing of reports for previously surveyed areas (Havelock Parish and Madawaska County) and the overseeing of contract soil survey work (St. Quentin-Kedgwick Project). Major emphasis was placed on such soil based problems as: soil crusting; germination on organic soils; deep tillage and related soil amendments; the determination of organic matter contents and soil erodibility K factors for a cross section of New Brunswick soils; involvement in a joint federal-provincial erosion study; site selection for apples and blueberries; and farm surveys and field inspections as requested for specific purposes. As well, soil interpretations and land use plans were developed in cooperation with various Planning Commissions.

Newfoundland

K. Guthrie

The Exploratory Soil Survey Program (1:250,000) is drawing to a close with the completion of fieldwork during 1980. Mapping and report writing is presently in progress and should be completed later in 1981.

The mapping program under the DREE Agreement (ending March 1983) is underway in areas of the province where more detailed soils information is required. Fieldwork under this program has been completed in some areas and is progressing in others.

The projects in which fieldwork was carried out during 1980 are listed in the attached summary:
During 1980, 9 people carried out fieldwork. Of this number, 2 are Federal employees, 5 others were hired under the DREE agreement and the remaining 2 were permanent employees of the Provincial Government.

In addition to the regular soils mapping programs, several related projects were undertaken. The Newfoundland member on the Mapping Systems Working Group has been following the recommendations of the Working Group closely during summer fieldwork in order to test their applicability to Newfoundland so that standarized methods can be employed. A summary of the occurrence and distribution of ortstein soils in the Robinson's - St. Fintan's area of Western Newfoundland was prepared as a result of fieldwork during the past few summers and lastly, an investigation was carried out for evaluating and mapping muck soils derived from alders for their potential agricultural use.

PROJECT NAME	SCALE	AREA	STATUS
Belleoram - St. Lawrence	1:250,000	10,000 km^2	Field work complete 58% of mapping completed.
Gander Lake	1:250,000	17,340 km^2	Field work, sampling and maps complete.
Red Indian Lake - Burgeo	1:250,000	24,000 km^2	Field work complete, maps in progress
Goose Bay	1:50,000	730 km^2	Field work 1/3 complete
Humber Valley			
Pasadena - Deer Lake	1:25,000	195 km^2	90% of field work completed Mapping in progress.
Howley	1:25,000	107 km^2	Field work complete. Mapping in progress.
Goose Arm Road -	1:12,500	9 km^2	Field work complete.
Reidville -	1:12,500	2.8 km^2	Field work complete.
Whites River Road -	1:12,500	10 km^2	Field work complete. Preliminary map available.
Robinsons - St. Fintan's -	1:25,000	1,000 km^2	75% of field work complete.
Exploits River Area			
Browns Arm -	1:12,500	100 km^2	Field work complete.
Botwood - Point Leamington	1:12,500	150 km^2	Field work 60% complete.
Comfort Cove -	1:12,500	26 km^2	Field work complete. Preliminary map available.
Northern Arm -	1:12,500	3.5 km^2	Field work completed. Preliminary maps available.
Markland -	1:12,500	26 km^2	50% of field work completed

Nova Scotia

K. T. Webb

Progress

1. A request for a detailed soil survey was made by the Cape Breton Development Corporation (DEVCO) for a 485 ha block near Sydney. The land, if found to be suitable, would be developed and leased by DEVCO to interested farmers for crop production.

A Survey Intensity Level (SIL) 2 project was initiated at 1:20,000. A soil map and interpretive maps for selected crop suitability were produced and submitted to DEVCO to assist them with their development plans.

2. An SII 2 survey at 1:20,000 was requested by the municipal planners of Kings County in support of their development plan and zoning by-law. This is the first zoning by-law for rural planning in Nova Scotia. Consequently, it is extremely important that the planners make decisions that will encourage the introduction of similar plans by the other counties.

The soil survey information should enable the planners to accurately delineate land to be zoned for agricultural use. Sound decision making of both farm and non-farm development should also be assisted by the survey information.

The survey has been directed according to development priority areas. The first area of 2,025 ha has been surveyed and the soil map and selected crop suitability maps are scheduled for completion in spring 1981.

3. The Sussex area of New Brunswick is an important agricultural area that is experiencing steady industrial and population growth. The decision to develop the Sussex potash deposits has amplified the need for an effective development plan backed by suitable land base information.

In 1978 a pedologist of the Atlantic Soil Survey Unit stationed in Truro was assigned to work with the New Brunswick Department of Agriculture and Rural Development in conducting a soil survey of the area.

The agricultural areas are surveyed at a SIL 2 and presented at 1:20,000. The forested areas are surveyed at a SIL 3 and presented at 1:20,000.

Phase 1 of the project was completed by 1979 and involved the mapping of 20,250 ha centrally located within the Sussex area.

Phase 2 involves the mapping of 60,700 ha surrounding the Phase 1 area. For 1980, 20 per cent of Phase 2 has been completed.

4. The first priority of the Nova Scotia Soil Survey is the resurvey of all areas of the province that have been mapped at scales smaller than SIL 3. Pictou County (290,000 ha) has been in the process of resurvey at 1:50,000 since 1978 and was completed in 1980.

A network of soil water wells has been established in Pictou County since the initiation of the project and are monitored weekly.

The soil survey of Hants County was initiated in 1980. Hants is one of the two remaining areas to be mapped at a SIL 3 under the county resurvey program.

To accelerate the output of survey information the county has been divided into four sections that will be surveyed individually. Interim maps and reports will be published at the completion of each section. The mapping of the first section will commence in spring 1981.

Other Projects

1. The concern over the effects of long range transport of air pollutants and specifically acid rain on aquatic and terrestrial ecosystems is under increasing study in Nova Scotia. The speculation of acid rain increasing soil acidity prompted the survey unit to initiate the establishment of base line data for soil pH on two test sites.

These test sites have been monitored bi-weekly since 1978. The fluctuations in gravimetric moisture content, pH ($CaCl_2$ and H_2O), soil temperature and water tables are being recorded.

2. Soil erosion by water is the most widespread and most frequently recognized manifestation of soil degradation in Nova Scotia.

In recent years the area of corn grown for silage has increased, accelerating the rate of soil erosion.

To demonstrate and further our understanding of soil erosion the Nova Scotia Department of Agriculture and Marketing has established two sets of erosion plots. The monitoring of these plots is supervised by the Atlantic Soil Survey Unit in Truro.

The objective of this project is to demonstrate the magnitude of sediment and nutrient losses from soil erosion and the effects of cropping practices on these losses.

The plots are in operation and data are being generated.

Ontario

C.J. Acton

Soil and Land Use Inventories -

New inventories have been commenced in Niagara and Durham regional municipalities. Initial work was spent in each area during 1980 to establish mapping legends. The objective of this preliminary work is to establish greater control in legend construction to avoid proliferation of map units and unique symbol areas.

Land use mapping was conducted in the Niagara region during 1980 using a land use systems approach. A mapping scale of 1:10,000 was chosen for the intensively used area below the escarpment, and 1:25,000 scale for the area above the escarpment. Socio-economic data was obtained through farmers' questionnaires representative of the major farming systems in the region. This programme was carried out with the support and cooperation of Agriculture Canada, L.R.R.I., and O.M.A.F., utilizing the Summer Youth Employment Program to hire student manpower.

Soil interpretations of inventory information has progressed to include suitability ratings of soils for tobacco production, and woodland management in the Haldimand-Norfolk region, and horticultural as well as tree crops in the Niagara region. Rating guidelines have, and are, being developed with the assistance of specialists in these regions.

Interest for the inventory programme is high in the Niagara Region where Horticulturalists are concerned about grape quality-soil relationships, soil drainage, water table-temperature relationships, etc. Regional Planners also have been involved in preliminary discussions relating to the need for the inventory, scheduling, etc., and have provided a major impetus for commencement of this project.

Soil inventory projects have been initiated in Northern Ontario during 1980 by private consulting firms for the Ministry of Natural Resources. The project in the Cochrane District will be carried out in an area of approximately 900 km^2, whereas in the Hearst District approximately 950 km^2 will be mapped. The purpose of these surveys is to provide the needed information on the soil resources for forest management planning. Mapping will be at a scale of 1:15,840 but the SIL is considered to be 3.

A Predictive Soil Mapping project also has been contracted by the Ministry of Natural Resources to the Ontario Institute of Pedology in the Chapleau-Foleyet map sheet of Northern Ontario.

The soil map will be compiled at 1:250,000 scale utilizing geological, forestry, climatic maps and aerial photographs, with ground truth at selected sites with maximum predictability. The approach, if proven efficient and reliable, could have wide application throughout much of the northern region.

Ecological Land Classification and Forestry Interpretations -

A research project currently is underway in the Claybelt region of Northern Ontario involving development of a mapping and classification system for forested lands. This research study involves the cooperative efforts of five agencies namely the Northern Region and Ontario Forest Research Centre, Ontario Ministry of Natural Resources, Great Lakes Forest Research Centre, Canadian Forestry Service, Ontario Institute of Pedology, Land Resource Research Institute, Agriculture Canada, and the Lands Directorate, Ontario Region, Environment Canada. A pilot study was undertaken in 1979, and in 1980 a three-year program was commenced, utilizing DREE funding. The program includes classification, mapping, interpretation and extension components. Progress during the current year included organization, training of staff and conducting a field sampling program. A total of 250 plots were sampled and described with respect to soil, forest floor, vegetation, forest stand and forest regeneration. Data currently is being edited, coded and some preliminary classification and ordination analyses commenced. The main data analysis is planned to be completed by April 1981.

The mapping phase of the Forest Ecosystem Classification project will be the main activity during 1981, including establishing mapping criteria, survey intensity level, legend building, airphoto interpretation and ground truthing. Four areas totalling approximately 30,000 acres have been proposed for mapping.

A pilot study was commenced in 1980 to establish soil suitability ratings for woodland management in Southern Ontario. This project was funded by Ontario Ministry of Natural Resources for a 6 month period and involved a review of literature, discussions with forestry staff to establish the types of interpretations to be considered, preparation of interpretive tables for the soils of the Haldimand-Norfolk region, and a training program to demonstrate application of the soil interpretations in the field. The project now has been expanded and extended for an additional four years, to provide soil interpretations for woodland management in several counties of Southern Ontario. Training of field foresters in the recognition of local soil conditions and application of the interpretive guidelines also is involved in the project.

Generalized Soil Map of Ontario -

The preparation of a Soil-Landscape Map for Ontario has commenced. The objective of the map is to provide a generalized land-resource information base which would have application for broadscale planning, educational purposes and as a basis for soil correlation. A scale of 1:500,000 is planned for publication, however, the information is being compiled at the scale of 1:250,000. C.L.I. Agricultural Capability maps are being utilized to delineate soil-landscape units which are then refined and characterized based upon information in county soil reports and maps, geological publications, etc. An extended legend has been established to characterize and classify the mapping units. Differentiating characteristics of the mapping units include parent material origin and texture, surface expression and landform, drainage, depth, soil development (expressed as taxonomic classification at the Great Group level). The dominant condition pertaining to the map polygon is given by means of a parametric coded map symbol. Both dominant and significant contrasting conditions are described in the extended legend.

It is the intention to have an accompanying report to:

a) provide the setting for soil-landscapes in the province, i.e. generalized geology, vegetation, climate sections including small scale maps;

b) describe more fully the characteristics of the soil landscape units, including major constraints to use;

c) define terminology, classification systems, methods of preparation, limitations, etc.

User Surveys -

A study conducted by Ecologistics Ltd., Kitchener, under contractual arrangements with Agriculture Canada examined the use being made of soil survey, and derived information, by land use planners. The types of applications of soil survey information which planners are attempting and problems associated with these applications are examined in the report.[1]

In general, some of the pertinent findings relative to the ECSS are as follows:

1. The predominant use of soil survey related information was for determining agricultural land potentials. The

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[1] Cressman, D.R. Requirements for Cost Effective Delivery of Soil Survey Information to Land Use Planners. Prepared for Land Resource Research Institute, Agriculture Canada, under contract to Supply and Services Canada, Ecologistics Ltd., Kitchener, Ontario.

CLI Soil Capability for Agriculture was used as the basis for this evaluation.

2. The predominant non-agricultural application of soil survey information is related to constraints for residential development based on septic systems and on-site water supply.

3. There are often errors in applying and/or interpreting CLI agricultural capability information by planners, e.g. incorrect interpretation of class limitations, errors in the classification of small parcels of land, misinterpretation of complex symbols, errors in interpretation in the preparation of more detailed capability maps from air-photo analysis.

4. Relatively few problems were encountered in the direct application of soil survey information by planners, which was mainly attributed to limited use of this information. The most common problem is enlargement of published maps with no additional field work. There are no cautionary statements in the text or on the map about the precision of map units. Also problems do exist in the use of underqualified personnel for interpreting soil survey information.

5. Most planners had difficulty in identifying a minimum area to which land use allocation decisions would apply. Most wanted as much detail as possible in the information base since it might be useful during subsequent stages of planning or for development control work. This reluctance to be specific about minimum areas made it difficult for a pedologist to recommend an appropriate level of detail of mapping.

6. The problems caused by Pedologists include the following:
   - no explanation of underlying assumptions on interpreted maps (CLI) and in survey reports which causes lack of confidence in the information particularly where planners may be required to defend it;

   - absence of information about data collection methods and map unit variability has extensively jeopardized the credibility of the mapping;

   - there is no readily apparent source of assistance to the planner in determining what soils information is available or how existing surveys can be interpreted and properly utilized for determining land allocations;

   - the lack of capability rating systems for specialty crops handicaps planners in some regions;

6. (cont'd)

   - Pedologists are more conscious of the relationship between map scale and mapping detail than are planners. To the planner, this concern about map scales is quite academic and cautions about incongruities between scale and level of detail of decision-making go unheeded.

   - the number of soil properties relevant to the land use planners' concerns are sufficiently few to warrant a simpler, less costly and more rapid system of classifying and mapping soils than that based on the Canadian System of Soil Classification.

In particular, two conclusions were drawn from the study which are of significance to the ECSS:

1. Evidence was found of some serious problems which may arise when new soil survey and/or soil capability is supplied to planning agencies by those outside of the operational soil survey program. Guidelines are needed for private sector groups in servicing the needs of planning authorities.

2. To enhance the cost-effectiveness of soil survey programs more effective matching of information needs with survey procedures is essential. To the survey planning steps suggested by the Expert Committee on Soil Survey (1979) should be added four critical questions that need to be addressed in order to determine the level of precision required in the survey:

   i) What decisions are to be made on the basis of the inventory?

   ii) What information is needed to make these decisions?

   iii) What impact will errors in information have on the decisions being made?

   iv) What impact will incorrect decisions have on the decision-maker?

Close interaction with the user group during the planning stages of soil surveys is essential if an over or under supply of information is to be avoided and the necessary information delivered in a manageable format, on time and at an acceptable cost. Despite the difficulties of attempting to reconcile potentially conflicting priorities of various users of the multipurpose operational soil surveys, it is essential that this process be attempted if cost-effectiveness is to be enhanced.

Québec

Roger Baril

Nous nous bornerons dans ce bref rapport au domaine de la pédologie (Soil Survey) de l'Institut de Recherche Pédologique du Québec. Ce dernier organisme est constitué de MM. Marton Tabi, Directeur, Michel P. Cescas et J.S. Clark, lesquels représentent respectivement le Ministère de l'Agriculture, des Pêches et de l'Alimentation du Québec, le Département des Sols de la F.S.A.A. de l'Université Laval et l'Institut de Recherches sur les Terres au Ministère de l'Agriculture du Canada.

Inventaire et cartographie des sols par les différentes équipes de Pédologues.

1. Equipe provinciale. - Etat d'avancement des travaux et publications.

Les études aux rapports pédologiques des comtés de l'Islet et de Rivière-du-Loup sont sortis des presses en 1980 sauf pour les cartes pédologiques qui sont encore en préparation à l'Institut de Recherche sur les Terres du Ministère de l'Agriculture du Canada. Nous espérons que l'on fera diligence pour faire parvenir les cartes le plus tôt possible. Ajoutons que le rapport et les cartes d'études des Iles d'Orléans et aux-Coudres devraient normalement être prêts pour la publication. L'étude pédologique du comté de Charlevoix, soit le bulletin technique et la carte pédologique qui l'accompagnent, devraient être publiée cette année. L'étude pédologique du comté d'Arthabaska sera déposée pour publication cette année. Dans le comté de Frontenac, on a procédé, à titre expérimental, à une cartographie géomorphologique des terrains par les techniques d'interprétation des cartes, puis des photos aériennes. De cet examen initial très poussé pour délimiter les formes de terrains représentatifs, on procède à l'examen conventionnel des séries de sols et de la position qu'elles occupent dans les "pédo-paysages" distincts: ce qui permet de mettre en corrélation les unités cartographiques et taxonomiques de sols avec les formes de terrains.

Par cette approche, on espère augmenter la précision et la célérité dans la confection des cartes pédologiques. Il serait intéressant d'ajouter à cette méthode celle de la cartographie des sols par transect tel qu'exposé par C. Wang l'an dernier à cette tribune même. Les détails de cette méthode "révolutionnaire" dans le domaine de la cartographie des sols ont été présentés dans le rapport de la deuxième réunion du Comité d'experts sur la prospection pédologique qui s'est tenue à Ottawa en mars 1980.

Priorités de recherches

Les besoins et priorités de recherche sont réévalués chaque année. Donnons ici la liste des besoins et priorités de recherche tels qu'ils ont été présentés par la section de pédologie à la Commission des sols du CPVQ (Conseil des Productions Végétales du Québec).

Priorité 1

Cartographie détaillée et semi-détaillée des sols minéraux.

Sous cette rubrique, on comprend aussi: a) l'étude des relations sol-paysages; b) l'étude de la variabilité des unités taxonomiques (séries de sols) et des unités cartographiques ainsi que leurs relations; c) la révision des classes de drainage pour fins de classification; d) l'étude de la température et de l'humidité du sol; e) l'étude du régime hydrique du sol; f) la compilation et le traitement informatique des données pédologiques.

Priorité 2

Cartographie et classification des sols organiques.

Nous nous permettons de proposer que le gouvernement fédéral consente à l'engagement de personnel supplémentaire pour défrayer le coût en salaire et autres dépenses d'un pédologue assisté d'un(e) aide-étudiant(e) l'été pour démarrer la cartographie systématique des sols organiques dans certains secteurs choisis des régions de Montréal et de Québec.

Priorité 3

Evaluation et utilisation des sols et des terres.

En rapport avec cet objectif mentionnons: a) l'amélioration des classes du système de l'inventaire des terres du Canada (ITC); b) l'établissement de relations entre les propriétés des sols et leur aptitude à produire certaines cultures.

Priorité 4

Dégradation et réhabilitation des sols.

Sous cette rubrique, on entend: a) l'étude de l'effet de la compaction sur la structure et la capacité de production des sols; b) l'étude de la dégradation des sols à l'enlèvement ou à la perte de la couche arable (Ap); c) l'étude des cultures intensives sur la perte de la matière organique des sols de la Plaine de Montréal; d) les études génétiques des sols comportant des couches compactes, dures ou cimentées; e) l'utilisation de la tourbe pour combattre la dégradation des sols.

2. Equipe Fédérale -

La cartographie pédologique du comté de St-Hyacinthe a été complétée. Celle du comté limitrophe de Richelieu a été commencée par la confection d'une carte pédo-géomorphologique à l'échelle de 1/50,000ième. Cette étape préliminaire rejoint dans sa méthodologie celle qui a été exposée précédemment en parlant du comté de Frontenac. La cartographie détaillée commencera à l'été 81 dans la partie sud de Richelieu. Les levés préliminaires de Verchères débuteront à l'été 1981.

Deux nouveaux pédologues sont venus depuis novembre 1980 enrichir les rangs de l'Equipe fédérale en la personne de Mlle Lucie Grenon et de M. Régis Simard: ces additions comblent les postes vacants suite au départ de MM. R. Marcoux et André Brunelle. Le personnel de l'équipe se compose maintenant de 5 pédologues, 4 techniciens et d'un commis.

En marge, mais non moins relié aux travaux d'inventaire, mentionnons l'aide de trois étudiants dans l'installation et la surveillance de 30 puits pour mesurer la hauteur de la nappe phréatique dans le comté de St-Hyacinthe. Ajoutons une enquête-questionnaire afin de déterminer dans quelle mesure l'on fait usage des cartes pédologiques. Quelque 850 questionnaires ont été envoyés à différents organismes ministériels et privés afin de mieux connaître leurs besoins d'information en matière de cartes pédologiques et de l'utilisation possible de celles-ci. Le questionnaire a été expédié en février dernier et les résultats seront compilés au cours de l'été 1981.

Recommandations

L'Equipe fédérale a accumulé à ce jour au-delà de 8000 fiches quotidiennes de données. Celles-ci ont été analysées d'une façon manuelle et de manière bien imparfaite. Il serait nécessaire que le CANSIS développe rapidement un programme d'entrée et de sortie des données: ce qui permettrait une étude statistique plus conforme et plus complète de données. Ce programme serait utile à toutes les provinces.

3. Université Laval - Département des sols.

Dans le cadre du projet de recherche comportant l'établissement d'unités d'aménagements dans une aire donnée du comté de Lotbinière suite à une cartographie pédologique détaillée à l'échelle de 1/20,000ième, on a procédé à une phase d'étude semblable et comparative sur une portion du comté de St-Hyacinthe. Un échantillonnage serré d'échantillons de sols a été fait et ceux-ci seront analysés cette année.

Mentionnons notre collaboration dans la publication des études pédologiques des comtés de l'Islet et de Rivière-du-Loup. Le bulletin technique de ces deux comtés a été publié par le Gouvernement du Québec tandis que les deux cartes pédologiques qui accompagnent les bulletins n'ont pas encore été publiées. Ces cartes sont confectionnées par le Service de Cartographie de l'Institut de Recherches sur les Terres du Gouvernement Fédéral. Mentionnons aussi une recherche sur l'utilisation du spectrophotomètre pour la détermination de la couleur des sols: ce qui a pour but d'éliminer le facteur personnel dans l'appréciation des couleurs. Cette dernière étude se greffe à celle déjà entreprise pour trouver de meilleurs critères d'identification de certains sols brunisoliques et gleysoliques de la Plaine de Montréal.

Besoins de cartographie des sols par l'Université.

Nous croyons qu'une équipe relevant plus spécifiquement de l'Université en collaboration avec l'Equipe fédérale pourrait répondre à certains besoins de cartographie détaillée et de recherche en genèse dans des régions sur lesquelles nous avons peu d'information, i.e., la Gaspésie, l'Abitibi.

Parallèlement aux travaux de cartographie, le programme de recherche de l'I.R.P.Q poursuit des travaux spéciaux en géomorphologie, en minéralogie, en micromorphologie et caractérisation des sols. Ces travaux visent à résoudre des problèmes particuliers concernant la caractérisation des matériaux originels, la genèse, la classification et la cartographie des sols.

Saskatchewan

D.F. Acton

The major thrust of the soil survey program in Saskatchewan continued to be the re-survey of the agricultural region of the province. In this regard four rural municipalities in southeastern Saskatchewanm comprising 400 000 hectares were mapped. In addition to this, preliminary correlation work was initiated in west central Saskatchewan where we anticipate mapping to begin in the coming field season.

Some of the highlights and supplementary and complimentary activities associated with this basic survey are as follows:

1. The development of soil survey publications for each municipality covered as part of the basic survey.

To date most of the activity has centered on the soil map document where an attempt has been made to control the number of mapping units as well as to "close" the soil genetic component of the mapping unit. We have just initiated the development of a series of interpretive maps and other material to complement the soil map.

2. The soil survey initiated in the Battleford area of west central Saskatchewan has been able to document in a preliminary way the extent of acid soils in this area. A schematic map has been produced and distributed, less than one year from initiation of the survey.

3. As part of the survey in the Battleford area, a geological consultant has been contracted to compile the geology of the area. Such a compilation will become an integral part of the soil survey in that it will focus on glacial stratigraphy and glacial history. It will also be incorporated into the municipality publications as a part of the framework for this land resource publication series.

4. Cooperated with the Saskatchewan Research Council in an overview of the potential hazardous effects of acid rain in Northern Saskatchewan and Alberta. This was quite a challenge considering the Soils of Canada is the only soil data base to draw on for Northern Saskatchewan.

5. Initiated a research study involving hydrological monitoring as a basis to relating soil morphology, particularly of wetlands, and hydrological regimes. Approximately 50 piezometers were installed in a 50 ha site, including five wetland areas with apparent differences in soil morphology and moisture regime.

6. Continued a soil salinity monitoring program in conjunction with the Saskatchewan Department of Agriculture where we are responsible for salinity and groundwater evaluation at approximately 10 sites where agronomists are investigating critical methods of managing saline soils.

7. Minor but important activities included an appraisal of the environmental assessment statement on the impact on agriculture of a uranium refinery at Warman; the preparation of a paper on the land resources of the Prairie Provinces for presentation at the Canadian Wheat Board - Prairie Production Symposium; and the analyses of the soil resources as part of an environmental assessment study for a proposed new potash refinery in south eastern Saskatchewan.

Some of the major needs of the survey in Saskatchewan that must be met if our current programs are to be successfully concluded are as follows:

1. Provision for additional soil survey parties to enable the survey in the acid soil region to become a viable one without detracting from the ongoing surveys in east central Saskatchewan, where soil resource inventories are desperately needed as a basis for soil salinity investigation and control.

Preliminary indications are that farmers in a 1/4 million acre area of west central Saskatchewan may be able to increase returns by 10 million dollars a year by liming the acid soils. As such, a recommendation should be forwarded through CCLRS to CASCC to suggest that the Province of Saskatchewan provide resources immediately for two additional soil scientists to ensure that this problem soil area receives the attention it deserves.

2. Climatic analysis as a basis for interpreting soil information for crop production. This could involve contract to private consultants or the Saskatchewan Research Council or perhaps deployment of staff already in place in Agriculture Canada to such endeavors.

3. Continuation of funding for geological investigations such as those provided in the past year. In all likelihood the geological compilation currently underway in the Battleford Sheet will require additional field exploration to fully develop the geological framework. If this is not required, a similar compilation to the Battleford Sheet should be undertaken in the Melville area.

4. Considering the paucity of soil information in Northern Saskatchewan and the potential environmental impact of acid precipitation from tar sands and heavy oil developments, it is suggested that the CCLRS be requested to recommend to Environment Canada, Saskatchewan Department of Environment and the Saskatchewan Department of Agriculture, that the collection of base line soil information be initiated immediately.

Terms of Reference for Working Groups

The terms of reference that follow reflect mainly newer concerns; some activities nearing completion have been omitted. Under some topics comments by participants at the March 1981 meeting are appended. Numerical headings mean (1) objectives (2) rationale (3) relative priorities and schedules (4) current reporting status.

I Classification and Nonagronomic Interpretations Working Group

IA. Landforms

1. To devise a regional landform classification, to review the suitability of the present local mineral landform classification, to finalize and integrate organic landforms into local and regional classifications.
2. We need a physiographic framework for soil surveys and mapping units (stratification); it could be no more than a modification of the Bostock classification but should be investigated in cooperation with Terrain Sciences Division of EMR and similar agencies.
3. High priority for organic landforms, medium priority for integrated regional classification.
4. Continue work on organic component in 1981 and 1982 on west coast, complete a first draft of organic component March 1983, complete integrated regional classification March 1985.

Vold of BC observed that landform mapping and soil mapping are complementary but different. He stated that BC will revise their landform system in 1981, and that a revitalized working group should establish renewed links with GSC under Fulton's lead.

IB Nonagronomic interpretation, brochures and other topics

1. To prepare guidelines for content and format of presentation of brochures and bulletins that explain use of soil information.
2. We need to publicize our work and products mainly at the non-technical level
   - : What is soil survey, what can soil information do for segments of the public?
   - : How are soil ratings prepared, how are derived and interpretation maps compiled?
   - : Specific interpretive packages for release to public by distributing agencies (ex rating of soils in county X for playgrounds, ski hills etc.).
3. High priority.
4. Workshop session March 81 and table progress report.

It was stated that we must have methodology and system in place before embarking on a publicity compaign, that the message to the public must be simple, and not oversell the product.

IC Soil classification

1. To prepare improved taxonomic classification of Canadian soils, to provide liaison and contributions to international agencies concerned for the development of international soil classification systems (U.S.A. and F.A.O.).
2. As our knowledge of soils increases the need for modification of the taxonomy and methodology continues.
3. Medium to low priority depending on the sector.
4. Work on Folisols to continue, progress report March 1981; organic soils characterization to continue.

ID Soil Climate

1. To systematically monitor the soil thermal regime on selected benchmark soils; to maintain liaison with workers in soil moisture regime group; to define the use of soil climate in the "System of Soil Classification for Canada".
2. Serious gaps in the characterization of soil climate pose difficulties in the soil classification system and in arriving at viable soil interpretations and land evaluations for various crops.
3. High priority is assigned to monitoring soil thermal regime because a greatly expanded data is required for subsequent progress toward achieving the long term objective: use of soil climate in the classification system. The latter objective is therefore accorded medium priority.

   Standardization of equipment, techniques, and monitoring procedures will be compiled into a "Provisional Methodology" for distribution in 1981.
4. Progress report March 1981, increased activity, and compilation of methodology 1981.

IE Soil Interpretations for Forestry

1. To develop guidelines for the interpretation of soil information for forestry, to develop improved methods and criteria for conducting surveys and for evaluation of forest lands, to determine the need for research projects in support of improved soil-forestry interpretation and promote their undertaking.
2. There is a well-documented need to make coordinated progress. See Helmut Krause report March 1980.
3. High priority for some sectors.
4. Progress report March 1981.

IF Soil water regime (SWIG)

1. To construct a working classification and a standard national format for characterizing water regimes in soils, and to formulate data collection and research needs in support of it.
2. The existing scheme for characterizing water regime is inadequate, and does not provide a good vehicle for handling expended data collection.
3. High priority.
4. To finalize a provisional scheme in 1981 and recommendations for national data collection program by 1982.

II <u>Correlation Working Group</u>

IIA Small Scale Maps

1. To prepare generalized maps of selected areas showing soil and landscape properties important to plant growth and the use, management and conservation of land.
2. We need generalized maps of soil landscape, physiography or landforms, crop production potential etc. that are compatible within natural regions such as great plains. These maps are of value from a scientific, educational and broad management point of view.
3. Medium priority.
4. Complete a first draft of soil landscape legend for southern great plans regions March 1981.

IIB Project plans, project monitoring and correlation procedures

1. To develop and test a document for recording, planning and correlation decisions.
2. Management of a survey project by the party leader, checking of the work by the supervisor and formal correlations have been conducted informally usually without completion of a written record. This often leads to misunderstanding of the objectives, forgetting of decisions reached on changes to be made, etc.
3. High priority.
4. Workship and progress report March 81.

IIC Soil Survey Procedures Handbook

1. To develop a handbook of procedures, both technical and administrative, recommended for use by agencies conducting soil surveys.
2. We have not fully documented the procedures followed to conduct soil surveys. These range from the critical terms of reference or specifications, through preparing for the survey, managing and conducting the Survey, reporting the Survey information, and to

interpreting and applying the survey information to solution of problems. Although we have made good progress with many technical aspects of the work it is necessary to begin the compilation of an integrated procedural handbook and to remedy gaps in documentation that exist.
Such a handbook would facilitate more efficient management of soil inventories.

3. Medium priority for elements, low for part.
4. Progress report March 81.

IID Soil Mapping Systems

1. To develop a mapping system suitable for application across the nation at all intensity levels, document the prescribed procedures, test their applicability and utility and prepare recommendations for their incorporation into field practice.
2. The need is great for documented procedures that will foster the production of more uniform maps and legends.
3. High priority.
4. A publication "Proposed soil mapping system for Canada" was released in 1979 in english and french. Testing and revision is underway; a workshop was convened in Vancouver in January 1981. A progress report will be derived in March 1981, followed by a revised draft of the system.

IIE Soil Survey Data Quality

1. To improve the quality and uniformity of field and laboratory data.
2. It is known that not all soil survey data are of the highest quality. Field data including mapping, site and soil descriptions, estimated soil properties and interpretive ratings, and laboratory data are the major concerns.

   Possible causes of these concerns may include insufficient knowledge and abilities or inattention by the mapper or laboratory technicians. Associated with these causes may be insufficient supervision, failure to periodically upgrade flagging skills, failure to provide and utilize reference standards and technical aids. Another cause may be the lack of routine procedures for evaluating and checking the concordance between field and lab data prior to its entry into CanSIS.

   Pathways for improvement of data might include:

   a. Development of routine procedures for checking of performance by the supervisor. Examples follow

   : At the soil pit does the mapper recognize diagnostic soil and site features required to meet the objectives and standard established?

: Do soil boundaries fit the landscape and the survey objectives?

: Do the analytical data fit the norms for similar soils; are data accurate as compared to relevant reference samples?

b. Development and use of supervisory reports of performance. Can these be used in a positive and constructive way for personal training needs?

c. Periodic refresher courses or workshops in survey units to improve or refurbish skills of mappers and to achieve uniformity of practice among unit members.

d. Development of improved methods and techniques; for example, structure and consistence description, porosity, analysis of transects, etc.

e. Development of improved instruction and testing aids to assist the achievement of uniformity. Can we anticipate the development of an instruction manual for use in training camps, technical schools and universities?

3. Priority high on some aspects (a and b), medium for others.

III Soil Information Systems Working Group

IIIA Canada Soil Information System (CanSIS)

1. a) Provide a communication channel through which difficulties or problems caused as a result of involvement in CanSIS may be reported and course of action planned.

   b) Identify and consider regional requirements for software, technical and capital support resulting from involvement in current and upcoming projects.

   c) Assume advisory responsibility for developing, testing and sponsoring training seminars on collection, updating, manipulation and retrieval of data interactively.

   d) Report annually the state of the art in geo-information activity in the natural resource and earth science disciplines on a regional basis.

   e) Develop cooperatively a national and regional CanSIS user policy dealing with issues such as user access, data security, legal responsibility of data use and interpretation.

   f) Coordinate development of regional CanSIS systems or nodes, including analysis and testing of core software developed by Ottawa and application software developed by the regions.

   g) Establish a newsletter to communicate CanSIS activity.

2. CanSIS was established to provide a mechanism by which soil survey information could be effectively managed. A data-base management system has been established to handle data on soil and crop attributes. National files have been established for detailed soil profile and landscape data, soil-crop performance data, soil names, and map data. To date the system has not been oriented to the operational needs of soil surveyors and agronomists. The current emphasis is to make the two subsystems of CanSIS serve as working tools in daily operations. This need has necessitated the development of a regional CanSIS network of terminals allowing local user access to the system.
3. High priority
4. Workshop session and progress report in March 1981.

IV <u>Land Evaluation Working Group</u>

IVA Land evaluation and Agronomic Interpretations

1. - to develop a revised soil capability classification system applicable to medium- and large-scale soil surveys;
   - to revise and update the crop productivity indices of Hoffman, and of Hutcheon and Clayton;
   - to review currently available classification systems for soil and crop suitability;
   - to develop refined quantitative procedures and classifications for croo productivity potentials based on soil, climate and economic data;
   - to develop publications which summarize soil technical data in a form suitable for the agriculture community, and provide predictions of soil behaviour under various kinds of management.
2. Some soil surveyors have attempted to rate soils for crops using modifications of the CLI procedures, or others, for presentation of tabular ratings in soil reports. Guidelines are needed for rating of the soil and nonsoil factors important to growth of crops in Canada.
3. High priority.

IVB Mapping of soil degradation indicators

1. To prepare criteria and classification of soil or land indicators of degradation.
2. Soil degradation is stated to be top research priority in most provinces. Mapping of location and severity are probable wants. The investigation of the possibilities for soil surveyors to map soil degradation might include:
   a) concentration on the parameters that control degradation, or
   b) estimating potential degradation on map units, or
   c) evaluating existing degradation on map units, or
   d) some combination of these.

ATTENDANCE

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